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Editor: G. K. Schneider

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Man is a part of the ecology of nature, but unlike other living species violates ecological laws. The widespread belief that he can ignore these laws is now being shaken to its roots by the emerging problems of the population explosion, air pollution, water pollution, decreasing water supplies, and food shortages.

Conservation of Man's Environment

HY RUCHLIS

Until recently the conservation movement has developed at a relatively slow pace. The principles of conservation have not attracted much public attention because most laymen and most politicians are not excited about saving some forest here, a waterway there, or whales in a distant elsewhere. When it is a choice between a new industry with its belching smoke, and a park, industry generally wins out. It represents the immediacy of jobs, prosperity, bigger cars, and similar matters of seemingly greater importance than trees or animals.

The surging population explosion and attendant air and water pollution, shortages of food and water, and perhaps soon, of breathable air, are beginning to strike directly at the pocketbook, and even at man's very existence. Consequently, people are beginning to sit up and pay attention to the menace.

It has been said that nothing is so powerful as an idea whose time has come. The time for the idea of conservation has come. Therein

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lies the hope of rapid progress for education of the public and, at long last, the overdue reversal of the mounting destruction of our environment.

Conservation is now ready to become a public issue of prime importance; it could well become the most important issue in the affairs of the world in the next few decades.

A new and different emphasis is required by conservationists if maximum development of public understanding is to occur. It is no longer adequate to limit the scope of public discussion to isolated inroads of industry on nature's preserves. The main emphasis of the conservation movement should now be centered around a broad consideration of all of the earth's resources.

The general public needs to be informed that the earth is finite, its matter available for production of goods is finite, and the sources of energy, although large, are also finite. They must also be made to realize that production and distribution of goods inevitably involve consumption of energy, alteration of matter, and creation of pollutants—processes which generally have adverse effects on the delicate balance of life on our limited, plundered planet.

One of the basic causes for the impasse which we are rapidly approaching is man's distorted view of what constitutes progress in earthly affairs. He equates progress with continuous growth in population, in production and use of goods, and in ability to travel around the globe or to distant planets. The business man whose sales this year do not exceed last year's by a substantial percentage; the worker whose purchasing power does not exceed that of the past; the youth who must have his car at the legal age of 18 (or less)—all represent aspects of this striving for growth of physical possessions and energy resources. Few realize that such growth in both numbers of people and ability to consume goods and energy is laying the foundations for a world in which few men, or none at all, can exist.

The striving for continuous growth, if it is to be satisfied, would ultimately require infinite space and resources. But the resources of the earth are finite. The contradiction can only be resolved by man's acceptance of the limitations of his environment, and scientific application of the laws of nature to his everyday mode of living. Drastic changes in his basic activities and values will be required in the next few decades to bring man once again into harmony with nature.

The Nature of Growth

A basic concept fundamental to understanding the problem is that continuous growth of any physical quantity—whether it con-

sists of energy, cars, people, food, or what-have-you—is impossible to maintain forever. The mathematician would describe growth as exponential in nature. In simpler terms we might say that growth (in absolute numbers) grows. For example, one germ grows, divides, and becomes two germs in a matter of minutes. Then two become four, four become eight, eight become sixteen, etc., in equal periods of time.

A characteristic of this type of growth is that the *new quantity at the end of any given doubling period is greater than the sum of the quantities of all the previous periods*. Thus, in the sequence 1, 2, 4 . . . , the sum is 7. At the end of the next doubling period the amount is 4×2 or 8, which is 1 greater than the sum (7) of all the previous amounts. Again, in the sequence 1, 2, 4, 8 . . . , the sum is 15. At the end of the next doubling period the amount is 8×2 or 16, which is 1 greater than the sum (15) of all the previous amounts.

This explosive aspect of germ growth arises from the fact that its population increases in proportion to existing population. *Each* germ of the larger population begets new germs. As a result, if there are 100 times as many germs, the absolute increase in germ population is correspondingly 100 times as great.

This kind of growth, if unrestricted, implies expansion to the outer limits of the universe in a finite time. In the case of germs, the time is very short indeed. One germ, one-thousandth of an inch in diameter, dividing and doubling in number every hour, would beget about 10^{144} germs in only 20 days. This vast number of germs would occupy a solid space millions of billions times as large as the volume of the entire known universe, out to the farthest galaxy 10 billion light years distant!

Corresponding calculation of future human population is complicated by factors such as fertility, improved health facilities, lower death rates, concepts of desirable family size, etc. Consequently, the simple type of growth manifested by germs is not directly applicable to human beings. Nevertheless, the general principle of impossibility of continuous growth applies to man as it does to germs. For example, a population that grows at a rate of only 1% a year would double its numbers in 70 years. Thereafter, if that rate of growth is maintained continuously, population would double every 70 years. Whatever the population happens to be at the start it would be twice as great in 70 years, four times as much in the next 70 years, eight times as much in the next 70 years, etc.

Today the rate of growth is greater than 1%, and the doubling period is correspondingly shorter—30 years at the moment. But the end result of unlimited continuation for man and germs would

be the same—a destructive, explosive, growth of population which must grind to a halt as resources of matter and energy are gobbled up. Man's intelligence and knowledge can, of course, halt this dangerous process before it reaches its conclusion.

Similar considerations apply to growth in the number of cars, to growth in the number of passenger miles traveled, to production of food, to consumption of water or oxygen. In such cases, the mathematical concept of "percentage" masks the truth about growth. "Per cent" means per 100. If there are 100 cars and they increase at the rate of 5% per year then there are only five new cars next year. But if there are 10,000,000 cars and they increase 5% in a year then the new increase is 5 per 100, or 500,000 for 10,000,000. The statement of growth as a definite percentage gives the impression of constant growth, when actually it represents *constantly growing* growth and implies explosive expansion in a finite time.

In one way, the mathematical situation with regard to explosive growth of industry is worse than with population increase because, if people consume more goods individually at the same time that the increase in population makes more consumers available, the pressure for growth is correspondingly greater.

The consequences of this concept are far-reaching. Its message to the directors of every large corporation producing physical goods is that some day their growth will have to come to a halt. It tells the president of a large airplane company that there will come a time when he will not be able to report an increase in the number of passenger miles flown. It predicts that all nations on earth, no matter how powerful they may seem to be now, will one day have to accept the fact that the gross national product no longer increases from year to year.

Dollar sales, purchases and incomes are another matter. The dollar is a concept—not a real thing like sacks of potatoes. We can mentally stretch the value of the dollar by means of inflation, ad infinitum. But things—the matter and energy—that the dollars buy cannot grow in number forever.

The time for stabilization may be ten years from now, a hundred, or a thousand. The specific time of crisis of growth is, of course, important to us at the moment, but the long-range picture is clear. Population, industry, consumption of goods, travel and all other *physical* activities of mankind must some day be limited in amount, whether we like it or not. And, if we disobey the laws of nature in this respect we may be able to postpone the consequences for a while, but we cannot alter the final outcome. We have no choice but to conform to the laws of nature and live with them, not against them.

Limitations of the Earth's Environment

The ultimate limit to food production is set by the finite amount of light energy pouring in from the sun which energizes the leaves of plants to produce food. The limits set by this factor are not as far off in the future as one might suppose. It has been calculated that the absolute limit of man's population set by inflow of light energy from the sun is 86 billion people. This upper limit assumes that almost all activities other than the minimum required to maintain life, would be sharply curtailed. For example there would be little or no meat because food production by animals is much less efficient in terms of use of energy, than production of food by plants. A more realistic maximum human population for the earth is about 25 billion. With current doubling of population about every 30 years, it is only a matter of about a century before our present 3 billion population reaches this practical maximum.

This maximum of 25 billion people assumes no similar doubling of adverse pollutant effects due to industrial growth, or to increased use of pesticides. So, it is likely that even this figure is too high.

In view of these facts, it is essential that we begin to examine each of man's activities in order to assess the extent to which it is compatible or incompatible with the ecological balances necessary to maintain human life. If an activity creates imbalances in major ways, then it is essential for controls to be established to prevent serious disruption of the conditions for man's life on this planet.

There should be no illusions that this will be easy to achieve. Some drastic changes may be required, not only in the kinds of industrial activities that are permitted to develop, but in certain values and habit patterns that are deeply ingrained in our society and resistant to change. It may require re-education for several generations to alter human attitudes appropriately.

To illustrate the nature of some of the changes that may be required, let us consider the automobile. Its widespread use has the following major effects on the natural resources of the earth.

a) Use of cars involves setting aside land that could be used for other purposes. Broad highways now criss-cross the country, and old cars pile up in vast junk yards. The expansion of road systems at the present rate must at some point in the future begin to interfere seriously with other basic uses of land for growing food, for homes, for recreation, and even for oxygen supply (as trees and other plants are reduced in number).

b) Large quantities of materials (iron, copper, other metals, plastics, glass, rubber) are used. Raw materials for some of these are in abundant supply; others are not. Continued accelerated use of these materials is likely to create raw materials supply problems in the future.

c) Large areas of the earth are ruined for cultivation as soil is stripped away to provide easier access to iron ore and coal needed to make steel for cars.

d) The production of parts of cars from ores and other basic raw materials involves extensive use of energy. The major material—iron—is made from iron ore by burning coke (made from coal), oil or gas, in various kinds of ovens or blast furnaces. At present, the process is accompanied by extensive atmospheric pollution as products of the combustion are released into the air. The plastics, glass, rubber and other materials of the car also require energy of a similar kind for their production, and each has its own form of pollution of air, water or soil. The long-range effects of many of these pollutants are not as yet known. Recently, cadmium in the atmosphere has come under suspicion as a possible cause of increased heart disease. Cadmium is one of the pollutants of processes of metal roasting and ore smelting.

e) Once the car is delivered to the consumer it begins to use vast quantities of gasoline produced from oil. And the oil supply is far from being limitless in extent.

A car that is driven 10,000 miles a year at 15 miles per gallon burns up about 700 gallons a year, or about two tons of gasoline. There are tens of millions of cars in use in the United States alone, and their use is constantly increasing.

So, at some future point in time we should expect shortages of oil to develop.

f) As the car burns gasoline it uses up oxygen it obtains from the air. The oxygen from as much as 300,000 cubic feet of air may be depleted by one car in one year. So far, extensive consumption of oxygen has not resulted in any noticeable reduction in oxygen content of the atmosphere. There is a cushion here as carbon dioxide is absorbed from the atmosphere by green plants and converted to food and oxygen. But production of cars and their use cannot increase indefinitely without at some point even beginning to deplete the earth's atmosphere of oxygen. That moment comes closer as our forests are cut down and oxygen-producing trees are destroyed.

g) The burning of gasoline during the operation of a car produces a variety of pollutants which have adverse effects on living

things. Some of the potential pollutants are transformed by natural processes over a period of time into harmless or even useful substances, as is the case with the conversion of carbon dioxide to food and oxygen by plants. But it is likely that some permanent or long-term pollution occurs from automobile exhausts—as for example, the recent appearance of lead (from leaded gasoline) in Arctic snows.

Even carbon dioxide may have serious long range effects. There has been a 15% increase in the atmospheric content of this gas in the past 60 years. It is thought that continued increase in the amount of this substance may cause the temperature of the air to rise, with perhaps drastic results on the ice caps at the Poles, on the water level in the ocean, and on weather and climate.

At any rate, we don't know as much about the long-range processes and effects of pollution as we should, and it is certainly wiser to assume that if the 3 billion people on earth all had use of gasoline-burning cars that permanent, harmful changes in our atmosphere would be likely to occur in a relatively short time.

A Conservation Index

Suppose we assign a conservation index to man's activities, with a view to providing some measure of desirability or undesirability of the activity. Perhaps we could set 100 as the measure of a "perfect" activity—one that has little or no disruptive effect on the ecological balances in our environment on this earth. Reading a book, attending an art class, rowing a boat on a lake, planting a garden, walking in the woods, all would have a high conservation index, close to 100, because they involve little or no alteration of man's environment, over and above the food, air, water, clothing and shelter that man needs to maintain his life in comfort. Such activities, do, of course, involve some use of materials and energy. But these represent relatively minor use of materials and energy in comparison with the activity of driving a car—certainly if the comparison is on an hour-for-hour basis, or even on the basis of equal expenditures. For that reason, such activities would rate close to 100 on the conservation index.

Since it is not my purpose at this time to delve intensively into the detailed effect of specific activities on our environment let us arbitrarily designate four broad areas in the proposed conservation index, as follows:

0-25 . . . This category includes activities that involve major alterations of environment and which tend to create serious imbalances in the earth's ecology.

There is little question but that driving gasoline-powered cars would warrant a rating in this range. In fact, one would have to rate this activity close to zero on the basis of the extent of environmental alteration that each car produces, and also on the basis of immediate danger to life, especially in large cities.

War-making activities certainly belong in this category because of the immense amount of consumption of materials and energy and the environmental pollution that accompanies production and use of military goods. Certain types of war-preparing activities, such as nuclear-bomb testing, are especially dangerous because the alterations in environment due to radioactivity are so drastic.

Similarly, a rating close to zero would be assigned to lumbering of forest regions in a manner which prepares the way for devastating floods, or which irretrievably alters arable land and makes it unproductive.

25-50 . . . This category includes activities that involve some alterations of environment, but not so drastically that they pose any current threat to life or ecological balance. Electric lighting and operation of refrigerators and washing machines in areas serviced by coal burning generating facilities would probably be put in this category because the production of electricity involves some release into the atmosphere of pollutants that could cause disease and death. However, these pollutants are more controllable than the exhausts of cars.

Nuclear power facilities would probably be given a similar rating because of problems of disposal of radioactive wastes that could conceivably alter life through mutation or direct damage.

The rating for nuclear energy would go up if the severe pollution problems could be solved, and down if they can't be solved.

The rating would be higher in areas serviced by water power, as detailed later.

50-75 . . . Consider the 50-mark as the midway point which expresses our measure of the general compatibility of an activity with stability of the earth's environment. It would be our objective to alter activities with an index below 50 in such a way as to convert them to activities with index above 50 and as close to 100 as possible.

Production of electricity by water power would seem to belong in the 50-75 category because, once the system is erected, its operation requires no burning of fuels, does not use up large quantities of materials, uses no oxygen from the atmosphere, and creates little or no pollution of air, water, or soil. Of course, large quantities of materials and energy are used to build the dams and power sys-

tems, and these uses must be taken into account. But once constructed, the system can operate for perhaps a century with little further harmful effect on the environment. In fact, the many by-products of the process—flood control, irrigation, water supply, and recreation—may cause some to rate this activity in the 75-100 index range. But that's a minor point at the moment. There would probably be general agreement that this particular activity is not harmful to our environment, although there may be substantial argument about specific proposed constructions.

From this point of view it would seem wise to build up certain untapped energy sources, as for example, electric energy from tides, as proposed for Passamaquoddy Bay. Such tidal sources would not reduce available land area, and probably could be put to use in connection with fisheries development. Considering these advantages, it would seem that such projects are worthy of support by governments even though less expensive electrical energy sources are available. At the very least, they are worthy of some of the tax dollars now going to much less useful experimental projects.

75-100 . . . This category would include any activity which does not require substantial amounts of matter and energy and does not alter the environment unfavorably to any appreciable extent.

Education, reading of books, cultural activities of all kind—music, art, theatre—come under this heading. We would probably include TV in this category because consumption of energy and materials per hour per viewer is relatively slight.

Basically, activities in this category are in the realm of *ideas* which involve little or no consumption of matter and energy, over and above man's normal life processes.

Production of newspapers would get a lower rating than books because extensive decimation of forests is required to produce the paper. Whether or not this rating would be placed above or below 50 would depend to some extent on measures taken to conserve used paper so as to reduce demand for new forests. Balanced use of forests by consistent replanting that maintains available forest areas would also boost the rating.

Some production of materials and use of energy for even the highly desirable activities is required. For example, a book requires some paper, cover materials, glues, inks and printing. These represent only a fraction of the costs of books, which also include the work of authors, editors, artists, etc. But the amount of matter and energy used up per hour of reading, is extremely small as compared with taking a ride in a car for an hour.

Actual determination of the requirements of matter and energy for each product or service could be made using known procedures of cost accounting combined with techniques of economics. It would be necessary to trace back the industrial activities required to produce and distribute each product and to analyze the specific expenditures of matter and energy, and attendant pollutant effects. Comparison might then be made on the basis of use per hour or per dollar of cost. This data could then provide the information for determination of the conservation index on a relatively objective basis. Such data would be extremely valuable to governments in determining which industrial activities to encourage, discourage, or alter by means of research.

Practical Steps to a Solution

In the past, the activities of conservationists have been limited largely to conservation of land, and of plant and animal resources. To a large extent, the appeals have been directed to the esthetic and humane sensibilities of mankind. We must admit that this approach hasn't been too effective because people differ so widely in what they consider esthetically important and humane, and also because the lure of many matter-and-energy using activities is so deeply ingrained in our culture and value systems. Actually, as we have seen, the issue is much broader and of much greater concern to the average man as well as to political leaders. The issue is nothing less than preservation of the environment of our planet so that it will continue to support man's life indefinitely.

It is essential for leaders of society to begin to take the steps required to insure ecological stability. There is no mystery about what is required. Essentially, mankind must begin to treat the earth the way a farmer handles the land on his farm. Certain well-known procedures ensure that the farm is in ecological balance and continues to produce food at its maximum rate. Neglect of any of the basic procedures reduces production, and could even result in complete destruction of food productivity of the land.

There is enough scientific knowledge about what we must do. What is missing is the will and desire to do what must be done.

It is rare to find political leaders who can, by themselves, introduce the kind of extensive changes implied in this process. The basic impetus for such changes will probably have to come from an enlightened, concerned public. The scientific community and the conservation forces will have to take the lead in the process of educating the public to the point where it will not only support a basic program, but also insist that proper programs be enacted.

There are many signs that the general public is rapidly becoming aware of the problem. Newspapers and magazines now abound with articles about food and water shortages, population explosions, and air pollution. The public is ready for the deeper knowledge it will need to make suitable decisions.

There should be no illusions about the consequences of the conservation measures that will be required. Some of them will cost money—which will ultimately have to come from consumers and taxpayers. Some limitations of very undesirable activities may have to be undertaken. Deeply ingrained habit patterns and value systems will require change. But we can begin with technological approaches that involve a minimum of social change. Again consider the automobile.

The gasoline-powered car is designed for high power, high speed, open-road travel of the kind one finds between cities—not for local, big city traffic. A car that burns gasoline is an inefficient device for local transportation at low or moderate speeds. The engine burns gasoline even while one waits for traffic to move. The processes of pollution of the air continue—and may even accelerate—when traffic is hopelessly jammed.

Cars are too big. A car that weighs one-half as much consumes about one-half the amount of fuel, uses up one-half as much matter, pollutes the atmosphere only one-half as much and, if speeds were lower, would require substantially less land use for roads. Suppose that governments, eager to cause people to shift to much smaller cars for local use, built special roads in cities that accommodated only very small cars at moderate speeds. Suppose that license plates for such cars were made inexpensive, but that the rates went up very steeply for heavier cars. Demand would then shift to the smaller cars, production quantities on these cars would increase, and prices would become substantially lower. Eventually the big car, consuming large quantities of matter and energy, would become a minor element in local transportation.

Taxes on fuels that pollute the air could be steeply raised so that it would begin to be economical to use other sources of energy. For smaller cars, production quantities on these cars would increase, or pick up electrical energy from underground or side-of-the-road cables. In city areas near adequate water power, use of such cars would produce little pollution. In areas still obtaining electrical energy from fuels, the source of pollution would be transferred to the power house, but it would be much easier to control such a concentrated source of pollution than to do so for every car. Perhaps the electric energy could be generated at the coal mine, with special

treatment of the exhaust to greatly reduce or eliminate atmospheric pollution.

Use of battery-operated cars would involve greatly expanded use of power generating sources, and this factor must be taken into account in assessing the usefulness of electric cars. There just aren't enough water power sources available at the moment to substitute for energy now required by gasoline burning cars. Such water power sources would practically have to be doubled.

Certain promising new energy sources, such as fuel cells, should be explored more intensively, perhaps with research supported by government grant more extensively than at present. The fuel cell can consume certain fuels to produce electrical energy directly without formation of any atmospheric pollutants. If weight and costs could be brought down significantly, it would be an excellent source of power for cars. It could compete sooner with the gasoline engine if cars and fuels that pollute the atmosphere were taxed more heavily.

The process of nuclear fusion power is being investigated intensively, but it is still too early to tell whether practical energy can be produced in this manner without pollution and, if so, how soon it would come. A breakthrough here would greatly alleviate the problem.

Development of adequate, rapid, mass transportation for cities would reduce use of individual cars and thereby help solve part of the problem. Cities like New York, surrounded by water, could make greater use of waterways for transportation, thereby decreasing use of land, and conserving matter and energy expended to build roads.

The conservation movement should include in its program broad recommendations of this kind about industry, transportation, organization of cities and related problems as part of the over-all requirement for preserving man's environment. Without such leadership it is possible that man will blunder his way into a dead end. However, there are increasing signs that this will not happen. Within the past few years mankind has suddenly been confronted with a number of major consequences of past neglect. Population explosions, worldwide food shortages, air pollution, overcrowded cities, have jumped into the headlines. Man must now once again face the realities of air, water, food, and adequate shelter—problems which he mistakenly thought he had solved forever. Recognition of a problem is the first step to its solution—and the most important. Perhaps 1966 is the Year 1 in the conservation movement, the beginning of the time when the problems start to move toward solution.



Atop a tunnel locomotive in an earlier trip, Mr. Gilbert Wasserman. Alongside, Mr. Hans Behm, lunar geologist at Grumman, with a massive specimen separated from the earth.



At the shaft entrance ready to go back up to the surface.

Richmond Tunnel: III

GILBERT WASSERMAN

Richmond Tunnel, the aqueduct beneath Upper New York Bay connecting Staten Island with Brooklyn (Tompkinsville to Red Hook) at a depth of 1000 feet has been holed through as of early December, 1966. Four recent geological field trips sponsored by the Institute and Museum three of which were made shortly before this memorable occasion, making six trips altogether. (For the first two trips see: *The New Bulletin*: Vol. 13, No. 6, February 1964, pp. 61-62, and Vol. 15, No. 3, December 1965, pp. 32-35.)

The Perini Corporation has been kind enough to promise us additional access after January 1967, after the construction of two concrete footpaths, one on either side of the tunnel, is completed.

In our recent field trips we had set ourselves the task of trying to remove rock samples from the wall at fairly regular intervals. They were to be marked in such a manner so as to be able to orient them in space at some future time when they would be thin-sectioned and examined under the microscope to study the effect of area-wide metamorphism on the crystal fabric of the minerals therein.

Our first trip of this series was in early November, 1966, on a chilly Saturday morning. The City College Geological Club sent us one of its members, Mr. R. Monsey, to assist us; my son, Ira Wasserman, and myself completed the party.

The descent down the shaft with the men of the Saturday inspection staff, all of us crowded into the open-ended platform that was our elevator, seemed like something out of a movie about mining. As we dropped, the round hole of the sky receded into the distance overhead and soon disappeared, leaving darkness above and the endless cascading ground water. Our waterproofs, supplied by the Perini Corporation, kept us dry. After a descent of 1000 feet, which is equal to the height of the Empire State Building, we stepped out to the switchyard of mining rail equipment, locomotives, gondola cars, and flat cars. There were three switching tracks from which we drew equipment to make a three-car train to take us to our destination.

We had decided to venture no further than the next switchyard, about a mile ahead. The locomotive, however, was going all the way to the head of the tunnel, some four miles in distance. It would remain there until one o'clock which would be five hours later and we were not prepared to stay down that long. We bounced along for one mile, clinging to the top of our yellow locomotive like infantrymen on a tank on the way to battle. The first thing that struck us as soon as the locomotive left, was the wall of shattering sound that was made by the air pumps in this section. Communication was impossible but luckily we were well-rehearsed in our work and little more than sign language was needed.

Our technique was simple: We chose a rock surface, marked a horizontal horizon line by means of a Brunton compass, then an intersecting right angle dip line, both of which we measured and recorded. Marks on the wet rock were a problem. Having tried in vain to score the rocks with some hard instrument, we finally found that the use of red laundry markers was a partial solution to the problem.

The most difficult part of the procedure was separating our specimen from its 400-million year emplacement, without destroying our right angle markers. Needless to say this happened a few times until we became more skillful at determining where along the grain the specimen could best be split. After the azimuth of the horizon line, the dip of the vertical line, and the nearest wall reading of distance in the tunnel were recorded in the field book, the specimen was placed in a numbered paper bag, sealed with staples, and placed in one of two barracks bags we had brought along. On this trip we managed to wrest six samples away from mother earth. In addition the howl of the air pumps pursued us for two days afterwards as a background high-pitched note.

Our next trip down was two weeks later with Mr. F. Denzler, an earth science instructor at Curtis High School; Mr. Pavlik, Secretary of the City College Geology Club; my son, Ira, and myself. This constituted a full crew of four. Our main task again was to get samples from the wall for some area of the tunnel. This time we were prepared to stay the full time allotted and took some food along. We jammed into our special train once again at the switchyard of the Staten Island shaft. This time a party of engineers from the Board of Water Supply was making a regular traverse check on the direction of the tunnel, so we were quite crowded. It was a memorable fifteen-minute ride of bumps and lurches at a top speed of 20 miles an hour that brought us, quite shaken up, to the tunnel head.

At the tunnel head, which was then 1000 feet short of hole through, the three parties on the train separated to work on their individual problems. After taking our first sample from the wall, we began to make our way back down the tunnel on foot with instructions to the locomotive crew to pick us up and also any bags of rocks we would leave along the tracks. We were on the lookout for changes of facies on the wall rock, having been informed that somewhere in the area of our walk we would pass through three distinct rock types. The differences in the facies were disappointing. This was due to the monotonous moist gray rock dust covering everything. If we could have hosed the walls down as we went we would have been able to notice the change from Brooklyn gneiss to a more schistose variety of wall rock in the direction we were going. The big change to Inwood limestone or marble which we mistook for pegmatite was almost missed. We were attracted to it by a strange reddish deposit of wet rock dust which was not usual in pegmatite outcrops. The marble is commonly present throughout the New York City area between the gneiss and schist and its presence here was expected although not in such a pinched diminutive extent. We saw only about ten feet of it at Station 109600. (The entire tunnel runs from Station 105526 at the Brooklyn end to Station 130565 at the Staten Island terminus.) We collected eight samples on our walk back down the tunnel before we were picked up by the locomotive on its return trip.

Another Saturday trip was made by Mr. Denzler and Mr. Hans Behm some three weeks later. Good photographs were made although no rock samples were taken. They returned the complete distance to the Staten Island shaft on foot after the locomotive carried them to the tunnel head. On their long walk they found nothing new to report.

January 27 was the date of our most recent descent. Mr. Behm, Mr. Shelley Penn, mining engineer at Grumman Aircraft, and I got a ride on a regularly-scheduled concrete train leaving the Staten Island side at 10:40 A.M. These trains, in appearance like diminutive rail tank cars, when loaded weighed in at 34 tons, subjecting the tracks to extreme strain. The ride, as a result, lasted about 45 minutes at a sedate six miles per hour. We left the train at the contact area between the limestone and gneiss at Station 109565. After wetting the walls down, we were able at last to see the main limestone area to its full extent of 60 feet which we had been told had been mapped by the geologists. We took two samples in place on either side of the contact, photographed it, and returned by an empty concrete train.

Although there are still some opportunities left for additional work in the tunnel prior to complete concretization, certain summarizations are possible in the information added by this five-mile penetration of bedrock 1000 feet below the Upper Bay:

1. The three common facies of New York City rock are encountered in the tunnel, without sharp unconformities due to interbedding. There is Manhattan schist four-fifths of the distance from Staten Island to Brooklyn; then a small pinched out ten-foot area of Inwood marble, and the rest of the distance is in Brooklyn gneiss (a variety of Fordham gneiss).
2. There were reports that some serpentine emplacements were encountered along the length of the tunnel. Their importance in the study of the serpentine problem on Staten Island and elsewhere is considerable. Study of the foot-by-foot geology at the Board of Water Supply shows on exhibit there. Further investigation samples of serpentine were on exhibit there. Further investigation should be made of this interesting possibility.
3. The grain of schistosity was commonly at an angle of 45° dipping towards Staten Island. Preliminary joint readings showed a pattern of prevalence around South 50° East strike and Dip 65° North by East.
4. The oldest sediments overhead in the Hudson Channel, which is only 180 feet deep, are Cretaceous silts indicating that the major topographical features of the area have not changed greatly since that time.
5. Various instrumental surveys could profitably be undertaken in the tunnel before it is closed such as magnetic, gravimetric, radiometric, and cosmic ray.
6. Rock-sampling for thin section survey has already been undertaken and is half completed.
7. A detailed geological foot-by-foot mock-up of the entire tunnel would be an exhibit of great interest and scientific value for the museum.

The Purple Martins At Lemon Creek

HOWARD H. CLEAVES

Eleven years have passed since the publication of my article, "Purple Martins At Last," in the Fall 1955 issue of the PROCEEDINGS. The account related my effort, beginning in 1916, to induce the Purple Martin (*Progne subis*), our largest swallow, to nest on Staten Island. A firm colony was finally established in 1953 after thirty-years of intermittent endeavor. In each of the fourteen years from 1953 to 1966 inclusive since the inception of the colony, a carefully compiled record has been kept of the number of actual nesting pairs. Here is the score:

<i>Year</i>	<i>Pairs</i>	<i>Year</i>	<i>Pairs</i>
1953	6	1960	54
1954	14	1961	50
1955	21	1962	72
1956	30	1963	75
1957	30	1964	68
1958	46	1965	54
1959	64	1966	46

The method used in counting the breeding pairs is to wait until eggs have begun to hatch some time after mid-June and the parent birds are feeding the young. Martins prefer multiple room houses, each room measuring about six inches square and six high. The number of rooms in the houses at Lemon Creek varies from sixteen to seventy-two, the total for seven houses, each on its own twelve-foot pole, being two hundred and seven rooms. On a clip board I carry a set of sheets bearing a diagrammatic representation of the rooms, and by watching each house in turn, both with and without binoculars, the occupied rooms are noted and the fact of occupancy marked on the diagram sheet. The date of each observation, and what was observed, is jotted down in a special space on the sheet.

This tabulation is a tedious job requiring many hours of close observation on a number of days from about the third week in June to early August. All sides of each house must be carefully scrutinized, not just once, but on a number of different days. The reason

for this is that not all of the birds in the colony begin nesting at the same time. If a bird is incubating eggs it may remain invisible within the cubicle for considerable periods. Even if a Martin is seen entering a room this may not indicate that a pair is nesting in that compartment. There are unmated individuals—I call them *kibitzers*—who, prompted by inquisitiveness, walk along the porch ledge peering into room after room, entering some, and occasionally being roughly chased away by a member of a pair already established.

When the young are well feathered, or even when they are in the advanced pin feather stage, they crowd into the entrance hole or doorway in their eagerness to be fed, sometimes as many as four heads showing. An aggressive, well-developed individual may leave his home room and establish himself in an empty room next door, thus escaping from some of the congestion and perhaps improving his chances in competition for food. Care must be taken not to list as occupied a room into which such an enterprising youngster has transferred himself. I try to complete the census for the year before too much of this shifting about takes place.

The date on which the Martins first appear at Lemon Creek in spring, after wintering in Brazil, has varied from April 7 to May 2. From one to six or eight individuals may constitute the advance guard. They remain a short time, perhaps an hour or so, as if inspecting the premises, then leave. Days may pass before they reappear. In 1966 the advance guard of six or eight Martins arrived on April 7; then there was a period of fifteen days before they returned on April 22 with reinforcements. It was an exceptionally cold spring with heavy mortality in Martin colonies reported from farther north in New York State. We lost one adult male and three other individuals. Breeding pairs dropped from 54 in 1965 to 46 in 1966. Martins are insectivorous, their food being caught on the wing. If, after the birds arrive, the weather turns cold enough to prevent insects from flying for several days consecutively, vitality diminishes and death occurs.

In spring migration, Martins arrive in the southern United States at the end of January or in early February. Arrival dates for extreme southern New Jersey (Newport and Fortescue) are in the last week of March, approximately two weeks earlier than for Staten Island. The difference in latitude is about one hundred and forty miles.

Purple Martins are indifferent nest builders. They alight on the ground in casual search for material, picking up bits of straw, small dead leaves, and other oddments, adding mud if there has been a shower or if a wet spot can be located. They often use mud to build a barricade at the door, seemingly for the purpose of reducing the size of the entrance and to assure added privacy and security. After

eggs are laid (and at intervals during incubation), special material is added to the nest in the form of live green leaves which may lend a small amount of moisture as an aid to the incubation process. One tree the leaves of which I have seen the birds using for this purpose is the ailanthus. The female Martin may lay as many as five eggs, but four is probably the usual clutch.

Sanitation at the nest with Martins, as with many passerine birds, receives careful attention. After delivering food, the old bird waits for the discharge of fecal matter by the youngster. This excreta is white and enclosed in a membranous sheath called the fecal sac. The parent, either male or female, picks up this sac, carries it some distance from the nest chamber, and drops it. On a number of occasions I have seen a nestling Martin, perhaps half-grown or older, relieve itself in the absence of both parents. In this situation the young bird almost invariably protruded its posterior out the door and extruded the waste matter onto the porch ledge outside the nest chamber. From there it was picked up and carried off when one of the parents returned.

Newly hatched young are served food so small that when the parent arrives with a meal in her beak it is difficult to see that she has anything at all. As the young birds increase in size, so do the food items. Among these are Damsel Flies, Butterflies, Dragonflies, and an occasional Cicada or Harvest Fly. A young Martin presents a comical sight when fed a Dragonfly. The insect must be delivered head first, else it cannot be swallowed, and until swallowing is accomplished, the bird has two Dragonfly wings projecting from each side of its mouth and the long body of the insect extending out front. The parent Martin takes care to crush or remove the head of the Dragonfly before feeding her young, otherwise the insect might inflict injury on the baby bird with its powerful mandibles. One old Martin arriving with a Dragonfly held in the wrong position for delivery flew off a short distance, dropped the insect, then caught it again with the correct hold and made a successful delivery. I have also noticed that if the initial attempt to deliver a Dragonfly is not successful, the young bird may not open its mouth again to receive the food. In this situation I have observed the parent bird to fly away a few yards, carrying the Dragonfly with her, then swing around and make a new approach with delivery accomplished. It seems to be the arrival of the adult Martin that triggers the mouth-opening mechanism of the young.

In watching the birds hour after hour, one is sure to be witness to many incidents and behaviorisms, some most entertaining. On one occasion a mother Martin returned from a foraging excursion with something large and of a dark color in her bill. Instead of

alighting the bird hovered near the house, then backed away and tried another approach but did not make a landing. Through my binoculars it was easy to identify the object in her mouth as a Mourning Cloak Butterfly. The bird must have caught her prey by approaching it from the rear, since it was being held by the abdomen. The trouble was that the butterfly's wings were like blinders, making it difficult for the Martin to see where she was going. She finally made it to the ledge and fed her clamoring progeny.

The departure of the birds as the season draws to an end is on the stagger system. The pairs that were first to begin nesting are the first to leave when the young are on the wing, the family group seemingly remaining intact. Even when all of the young belonging to one pair of Martins are airborne the family remains in the vicinity for perhaps a week or more, absenting themselves from the home site all day, but returning in the evening to roost in the house for the night, probably in the same room in which the family was reared. During this period of training and conditioning I have observed the old Martins with their young in the neighborhood of Wolfe's Pond a half-mile from the nesting site, and even as far away as my home in Pleasant Plains and at Sharrott's Pond, two miles or more from Lemon Creek.

When the young Martins are fully feathered but reluctant actually to fly, one of the parents may give an assist. Once I saw an adult alight beside a youngster on the porch ledge and when the young bird opened its mouth to be fed, the old bird, which brought no food, grasped the begging offspring by the lower mandible and pulled it off the ledge, forcing it to fly. On its initial flight the young bird is accompanied by one or both parents, plus several neighbors, all of whom are highly vocal, acting quite excited. If the neophyte alights, he is likely to be nudged off his perch by the old birds and kept going. Unfortunately, quite a few young Martins die each year by falling to the roadway beneath some of the houses and are run over by automobiles.

When about half-grown, baby Martins become vocal in their desire for food by uttering a "chuck" note at intervals of a few seconds. This call is continued after the youngster leaves the nest and is perching on a wire or twig and may serve as a cue to its location when the parent comes with food. I once observed a young Martin perched on a wire, calling. When the parent arrived with food she alighted about five feet away, causing the young bird to make the effort to travel the distance between the two in order to be fed. I have also watched an adult Martin in flight accompanied by a young one uttering the "chuck" note and have seen the adult

feed her offspring on the wing. When this stage has been reached the young bird is soon to learn how to capture its own insect food in flight and the Martin family is then ready to take off on the aerial trek to South America.

End-of-the-season departure dates are determined by watching the birds coming in to roost beginning about three-quarters of an hour before dark on several evenings, usually the first week or so in August. Here is a diary notation from the year 1956: "Thursday, August 9, 1956. Was at Lemon Creek observing the Martins from 7 p.m. to 8:30 p.m. in company of Mrs. Carol Stryker and Miss Elsie Van Deusen. Martins could be seen high in air toward Wolfe's Pond, starting about 7:50. Many alighted atop a big sycamore near the old Inn at Purdy Street & Seguire Avenue. At 8:12 p.m. the bulk of the whole community of Martins drifted toward the three [Martin] houses, then rapidly settled on them and began squabbling over rooms for the night. By 8:23 most birds were inside.

"Monday, August 13, 1956. Only about ten birds came back to roost this evening.

"Tuesday, August 14, 1956. No birds came to roost."

Taking the four most recent years, here are the dates on which Martins nightroosted for the last time in each year:

1963—August 26

1965—August 30

1964—August 11

1966—August 18

The migration in the autumn back to South America is not a hurried affair. Our birds probably join others from colonies in New Jersey and move by stages southward, forming large assemblages in localities such as Cape May County, New Jersey, and Washington, D. C., in a pattern adhered to year after year. An assembly point for Martins near Jamestown, N. Y., is reported to contain an estimated thirty thousand birds. Once the Martins leave the houses where they have reared their young and slept at night for almost four months, their roosting habits change abruptly. They now begin using leafy trees as night roosts, arousing the ire of humans if these trees chance to be growing on city streets. In Baton Rouge, Louisiana, Martins chose the superstructure of an oil refinery as their nocturnal roosting site.

Our Martin colony at Lemon Creek is the only one in New York City, a fact which has added to its fame. Birders both singly and in guided groups have come to view the sight. A barber from Manhattan sent a check and wrote, "I do wish to contribute something towards the good work of keeping the Martins with us so that I may go down to the creek and enjoy them." (*September 5, 1966*)

COMMUNICATIONS

Evidence for Continental Drift

In October 1966, two Island geologists, Hans J. Behm and Gilbert Wasserman, attended the conference, "What's New On Earth," which took place at Rutgers University. This conference was announced as being designed to "provoke discussion of evidence for or against the existence, possible causes, and mechanics of fracturing, drifting, and rotating of continents and ocean basins." (Unfortunately copies of the complete papers will not be forthcoming possibly for another year so that sketchy notes are the only basis for this report.)

The conference was held in Scott Hall, in a modern, well-equipped auditorium. The morning session was to cover "Continental Geology." When we arrived, Dr. John C. Maxwell of Princeton University was already deep in his lecture on the geology of Europe. He was followed by Dr. Philip King who outlined the tectonics of North America, Eastern Section, and by Dr. Gillully who spoke on the same topic, Western Section. A setting of traditional structural geology was thus established for the areas where strange violations of uniformitarianism were to take place in later sessions.

The afternoon session, titled "Ocean Basins," started with Dr. H. W. Menard of Scripps Institute of Oceanography who described the fracture systems that were astride the San Andreas fault line in the Pacific off the west coast of the United States. These were called transcurrent or wrench faults and the displacements were truly amazing. They were first discovered by Vacquier while analyzing aeromagnetic contours over the Pacific off the coast. Study of the contours showed an amazing correspondence of contour after contour across various displacements of from 150 to 1170 kilometers.

Dr. Bruce Heezen of Lamont Geological Observatory was next on the podium. He was worried that there was not available some mechanism to balance his geological books, so to speak. He had found 182,000 square miles of new land created by displacement on both sides of the mid-Atlantic ridge which is spreading apart and could find no place where a like amount of land is being absorbed or folded back into the crust. The expansion theory of Egedy which postulated an ever-expanding earth was not enough to take care of this amount of new land. He left the platform the picture of a man carrying the burden of mid-Atlantic ridge surplus on his shoulders.

Dr. Robert Dietz of the U.S. Coast and Geodetic Survey, the next speaker, proceeded to amend the old concepts of miogeosynclinal

and eugeosynclinal belts, which have traditionally been used to explain the history of the alpine type of mountain belts. He substituted his off-continent geosynclines which accumulate sediment off the continental shelf, sink into the oceanic crustal sima, and manage to engulf outliers of serpentine from the crust by plastic creep. This is a possible explanation of the emplacement of serpentine in unmetamorphosed sediments in some areas. This concluded the first day of the conference.

The morning session of the second day, called "Geophysical Considerations," opened with Dr. Affleck of the Gulf Research and Development Company. The vast amount of aerial magnetic surveying done by his company allowed him to study magnetic anomalies on a continental scale. He showed on slides anomalies that were present at deeper depths of the earth's crust after cancelling off those anomalies due to surface features. An east-west fault, which connected to the Mendocino rift on the Pacific and was traced clear across the continent where it connected to a fracture system in the Atlantic, was well-documented by his prolific evidence. This amazing geophysicist then proceeded to show his collection of statistical rosettes, or graphical representation of trends averaged out of all the magnetic contours he could lay his hands on—in this country, and everywhere in the world. He preferred to remain uncommitted on the theory of continental drift until more data was forthcoming, offering a suggestion on the subject of paleomagnetism that perhaps the earth's magnetic field once had four poles instead of being di-polar as it is today.

Dr. D. W. Collison of the University of Newcastle-on-the-Tyne, England, was the next speaker. In a subdued voice and with typical understatement, he presented the case for polar wandering as contained in the remnant magnetism observed in many of the world's rocks. He argued for the close association of the magnetic and geographic poles which he based on recent geologic history and made the point that polar wandering is not possible without the assistance of continental drift. He showed this by tracing the magnetic poles during a series of ancient periods for two continents, Africa and North America. The divergent pole positions for the same period would fall into place when the continents were rotated. Other field evidence of structure and paleontology showing that continents now separated were once close together, added support to the validity of the theory.

Dr. Paul Lyons of the Sinclair Oil Company, the last speaker of the morning, is a geophysicist who specializes in gravity surveys. His contribution was two-fold: He made the point that the Archean

unconformity, or that point in earth history that divides the vast Pre-Cambrian period in half, 2,500 million years ago, was a major division in the life of the earth, and that another major revolution is now due, give or take a hundred million years or so. In the last fifth of the second half of this time-division on earth, the earliest forms of life appeared. His second point was a challenge to the continental drifters to use his new continental border based on gravity anomalies which he claimed indicated the real outline of the roots of the continent. He used a much greater depth than the 500 fathom contour line used now. As another exhibition of his thinking, he showed that by extending the penetration of his gravity and magnetic surveys, he was able to secure anomalies that he claimed were directly on the mantle. The contours showed definite relief or kinks at this great depth, which caused him to postulate that the drifters would have to take the mantle along with them as they drifted.

The afternoon and final session, called "Synthesis and Mechanics," started with Dr. Knopoff of U.C.L.A., a seismicist. He showed by the evidence of his timespeed charts of shock waves through the mantle that it has heterogeneity both vertically and horizontally. He also showed a construction of blocks and springs that illustrated the mechanism of earthquake shocks. Fundamentally it illustrated how kinetic energy stored up in one element, will erupt at some point of maximum absorption and transfer its shock to the next element and so on down the line. He showed present day earthquake patterns supporting this construction. Another important observation was that the lack of any anomaly over the Atlantic rise and the presence of an anomaly over the Pacific rise indicated the dormant nature of the Atlantic rise and the active nature of the Pacific rise as far as seismicity was concerned.

Dr. Tuzo Wilson was the next speaker. He is professor of Geophysics at the University of Toronto and is perhaps the leading proponent of continental drift. He illustrated some mechanisms with cardboard mechanicals that possibly could account for the eccentric movement of the continents. He called them "transform overlap faults" and he showed that they would hinge on one side and compress on the other, an example of which he claimed was the Lomonosov ridge. He then showed that certain "chevron" volcanic island systems were the result of lateral displacement in his transform faults. Next that certain magnetic field reversals which occurred at intervals of a million years proved the validity of his transform faults when the magnetic reversals were able to be traced and matched. He proceeded then with a most astounding recon-

struction of North America and England close to each other, drawing on the theory that the Appalachian ancient island arcs had been split when the continents separated. He showed the structural and faunal similarity in the fossils on both sides of the Atlantic to buttress his contention.

The last speaker, Professor Scheidigger of the University of Illinois, seemed to doubt the forces necessary to make the continents drift as claimed. He illustrated a method of contouring of tensor systems similar to that of gravity and magnetic anomalies. The tensor systems having six components would show areas of instability and intense stress. He also expressed his confidence in the possibility of instrumentation being developed to detect unbalanced forces acting on any area.

The conference was rewarding in that it gave us a sense of presence in the forward arena of geologic thinking. The eventual publication of the papers presented will undoubtedly fill the many gaps in this communication.

The evidence for continental drift seems quite overwhelming at this point. It actively explains many inconsistencies in world geology and may grow to even greater acceptance as the data keeps rolling in. Significantly not one open attack on the theory was made at this session.

—G. WASSERMAN (*December 12, 1966*)

The Leonids

During the night and early morning hours of November 16-17, 1966, the earth passed through a swarm of meteors. This swarm is known as the Leonids, because the paths of the meteors seen, when projected backward, seem to emanate from the constellation, Leo.

Mr. Charles F. Braun, from the Astronomy Section of the Institute, was among those invited by TWA to observe the shower from one of their planes, which made a special flight for this purpose. The plane left LaGuardia airport at 1 A.M., and flew to Nantucket. In this area the pilot flew many figure-of-eight patterns, giving all on board clear views of wide regions of the sky. Hence we were able to observe not only the expected Leonids, but any sporadic meteors that appeared. The plane flew at an altitude of 30,000 to 35,000 feet, well above the layer of clouds that blocked the view of New Yorkers.

Before and during the flight, Mr. Braun briefed those on board about the science of meteors and answered questions. He distributed star maps and literature about meteor showers.

Although the earth passes through the Leonid swarm each year

about this time, an unusually large number of meteors is expected every $33\frac{1}{3}$ years. This occurs because this particular shower is associated with Tempel's comet of 1866.

Although nothing like the spectacular shower of November 12, 1833, was seen, the count was well above the average for nights when meteor showers are not predicted. All the meteors seen were brilliant, and made short swift streaks across the sky.

The plane cruised almost 2000 miles, returning to LaGuardia Field about 4 A.M.

—CHARLES BRAUN (November 17, 1966)

Annual Christmas Bird Count 1966

At 5:30 A.M. on the cold morning of December 26, 1966, Greg Loan was creeping around under the evergreens in Moravian Cemetery, peering here and there for owls. At 5:30 that afternoon, Howard Cleaves recorded that the Screech Owl that lives in a nesting box on a tree near Cleaves' home had just left its roost and gone hunting.

Thus, these two together with sixteen other observers searched the woodlands, fields, and the seashore to record an estimated winter population of 57,219 birds for the Annual Christmas Bird Count which is conducted for the U.S. Fish and Wildlife Service under the auspices of the National Audubon Society. This was a record count for Staten Island.

The observers were divided into eight groups. This year each group could report at least one rarity among their observations:

Greg Loan and Eddie Stonick saw the Red-bellied Woodpecker, a southern bird, which has been seen at the feeders at High Rock Park for about three weeks. Greg also saw a Bluebird, which has been scarce for some years now.

At the beach at Great Kills, Henry Flamm and John Stonick saw a Snowy Owl, a surely uncommon sight, and a Lapland Longspur.

Robert Clermont, Anna Meyer, and Nick Wagerick covered the beach between Great Kills and Wolfe's Pond Park. In a field in Huguenot they found the very rare Vesper Sparrow, a bird frequently seen on migration but not as a winter resident. They also saw two Red-headed Ducks near Great Kills. The Red-headed Ducks have been a declining species for the last several years and it is nice to be able to record two on our count this year.

Further along the beach, near Ward's Point, Howard Cleaves and Charles Pearson, who is a former Staten Islander who comes all the way from Somerville, New Jersey, each year to help with the count, spotted a Great Blue Heron, a bird of the open marshes.

Esther Brewer and Dean Chipman, who spent more time inland, found a Purple Finch at one of the feeders.

Covering the Davis Wildlife Refuge and much of the area around the garbage dumps, Charles Fallon and John Matterfis found a Winter Wren at the Refuge. This is the second sighting of this species on the census since its inception on Staten Island in 1908.

Mrs. Benjaminson counted eight House Sparrows coming to her feeder. These birds, originally introduced as cage birds from the West Coast, have spread around the New York area and are now appearing on Staten Island.

Miss Weingartner and her group had along a young birder, Howard Fischer, who has very keen eyesight. It was he who spotted a flash of yellow darting into a bush. This flash of yellow turned out to be a Yellow Palm Warbler, which is only the second record of this bird on the census in all the recorded data. Howard Fischer also spotted a Snow Goose on the far shore of Willowbrook Pond. This bird had been reported in the vicinity for about a week. With Miss Weingartner also were Lucy James and Doris Barlow.

The weather was not altogether pleasant, but it could have been worse. Snow covered most of the land from about three inches deep to drifts of two feet in depth. The ponds were almost frozen, with very little open water. The temperature that day ranged from 21 to 31 degrees, and wherever the sun shone brightly the roads became slushy. Some of the Goldfinches were seen to come for a drink to the melt water. Walking was not easy during the day, particularly where the area had not been plowed such as in the fields and the woods, which of course is normally the case.

During the past building boom, birds have become more concentrated, so that they are easier to see and therefore, to count. I believe that this fact alone accounts for the increase in both total species, which was 73 this year, and in total individuals, 57,219, on the Annual Christmas Bird Count for 1966.

—M. P. WEINGARTNER (*January, 1967*)

LIST OF BIRDS:

Horned Grebe	23	Canvasback	1
Double-crested Cormorant	1	Greater Scaup	11,100
Black-crowned Night Heron	3	Golden-eye Duck	681
Great Blue Heron	1	Bufflehead	1,322
Snow Goose	1	Old Squaw	604
Mallards	102	Common Scoter	1,115
Black Ducks	72	Hooded Merganser	1
Red-headed Ducks	2	Red-tailed Hawk	5

Rough-legged Hawk	3	Mockingbird	16
Marsh Hawk	2	Brown Thrasher	1
Sparrow Hawk	7	Robin	23
Pheasant	118	Bluebird	1
Ruddy Turnstone	26	Cedar Waxwing	3
Wilson's Snipe	13	Starling	13,486
Purple Sandpiper	40	Myrtle Warbler	2
Dunlin	1	Yellow Palm Warbler	1
Sanderling	14	English Sparrow	287
Great Black Backed Gull	1,399	Redwings	357
Herring Gull	24,676	Rusty Blackbirds	10
Ring-billed Gull	23	Grackle	5
Bonaparte's Gull	91	Cowbird	145
Mourning Dove	158	Cardinal	75
Short-eared Owl	1	Purple Finch	1
Snowy Owl	1	Goldfinch	20
Screech Owl	3	House Finch	8
Kingfisher	1	Ipswich Sparrow	1
Red-bellied Woodpecker	1	Vesper Sparrow	1
Hairy Woodpecker	9	Junco	167
Downy Woodpecker	38	Tree Sparrow	268
Horned Lark	28	White-crowned Sparrow	2
Blue Jay	31	White-throated Sparrow	80
Common Crow	252	Fox Sparrow	35
Fish Crow	1	Swamp Sparrow	5
Chickadee	56	Song Sparrow	149
Tufted Titmouse	15	Lapland Longspur	1
White-breasted Nuthatch	14	Snow Bunting	10
Winter Wren	3		

BOOK REVIEWS

A Continent in Danger Vincent Serventy. Reynal and Company in association with William Morrow and Company. 1966. \$8.75.

For all its sadness, "A Continent in Danger" is a delightful book and especially so to anyone who has lived in Australia or Tasmania. With evocative charm it brings to memory the wide golden runs and paddocks extending to the trees and scrub which shelter and give sanctuary to the country's gentle harmless animals.

This is a story of the many animals and birds already sacrificed to ignorance and greed. It awakens a passionate realization of the necessity for action *now*, before more go the way of these others. Luckily nature conservation is of increasing interest to the public and the government alike, and demands are being made for areas

to be set apart as parks, sometimes of thousands of acres of bushland. Such was the case at King's Park in Western Australia where the author tells us that an attempt to make a rose garden was finally defeated and the area left to the wildlife and some aspects of the bushland so nearly lost forever.

The protection of the koala is a charming story. This most lovable of all Australia's animals is now, we hope, likely to live on and increase, to be the delight of future generations of the folk down-under. It is interesting to be told that koalas are not addicted to one particular species of gumtree for their food. The author describes them as browsing on a reasonably wide variety of Eucalypti, and even relishing box and paper barks. Pleasant also to be told of an advertisement of a building site which read, "Build here and live among the koalas"! A contrast to fifty years ago when a poor family would sell koala pelts to eke out their precarious income.

More recent immigrants apparently have still to learn the lesson that conservationists are trying to teach. One man shot a koala and gave as his excuse, "I thought it might have been a goanna (iguana)." Others shoot at the laughing jackass, the kookaburra, to make themselves a "Ha-Ha Pigeon Pie." The author describes the display of the lyre birds and reports the admiration of Katherine Hepburn and Robert Helpman for the beauty of their dance. He says it was from this experience that Helpman's ballet, "Display," was later to grow.

As a young person in Tasmania, I was fortunate to see platypus, three or four at a time, playing by the gently flowing Macquarie River, and once in a hilly part of that area, got a glimpse of the now extinct Tasmanian devil. More like a small black and white boar, I thought, than the bear or dog that the author describes. It grunted in a boar-like manner as it fled from our apparently terrified dogs, for they were evidently very alarmed by the scent of this, to them, unknown animal, and they came whining to cower at our horses' hooves. Dolphins, or porpoises as we called them then, were often the companions of the small steam ferry that took me to school, a joyous rout of delightful creatures. The only thing that took my gaze from them was to marvel at times over the appearance of a huge white bird, the albatross, his visits rare enough to claim even a child's wonder and awe as he sailed on outspread wings over the dark blue waves of the Derwent.

My grateful thanks go to Vincent Serventy for his fascinating book. I thank him not only for its scientific information and attractive and colorful illustrations, but also for the memories it brings back to me of far away and long ago.

—Reviewed by Dorothy Halkerston

Challenge of the Seven Seas Senator Claiborne Pell and Harold L. Goodwin. Wiliam Morrow and Company. 1966. \$6.95.

The ocean covers a large portion of the earth's surface, 72% to be exact, and is one of the major causes of weather changes as well as a major source of natural resources. Still it has received not nearly enough study by scientists and goverments. In contrast with the amounts spent for ocean research, much more has been spent on space research. Yet the potential value of resources from the oceans is incalculable in terms of food, minerals, and even a source of converted fresh water in the future.

Senator Pell and Mr. Goodwin have collaborated on a most timely and worthwhile book in "Challenge of the Seven Seas." It is tmieily because we are fast approaching the point where utilization of many resources of the seas will become vital as a substitute for fast-depleting protein resources. The underdeveloped nations are those in greatest need of the vast food resources which can be fished, farmed, or manufactured from the seas. The often-mentioned population explosion which the world is presently undergoing urgently requires additonal food resources.

The seas are a source of great reservoirs of power which can be utilized possibly in many ways, such as the employment of tides and the temperature differences between surface and deep water to furnish power by thermal pumps. Needed minerals in short supply from land sources can be harvested from the sea bottom and derived from sea water. And since the seas are the original cradle of all life, they are an important area for further study, eventual understanding, and potential use of many biological factors which are still mysteries.

The development and use of diving equipment with a portable air supply such as the aqua lung has opened under-sea exploration and collection to many swimmers since the 1940s. Research has continued to enlarge and increase these techniques of learning to live in "wet space" with the use of artificial lungs and sea-bottom housing in order to explore and exploit the sea. Unexpected legal or political involvements arise from various aspects of these activities and advice is given for coping with these otherwise extra-marine problems.

Senator Pell seems qualified to present such advice. A Senator from Rhode Island, he is considered one of the top Congressional experts on Oceanology. He has sponsored and introduced federal legislation on several bills for "sea grant colleges" and the Magnuson Bill which was written to create a Federal Council for Ocean Development. His colleague, Mr. Harold Goodwin, has written over

thirty books and is a specialist in writing scientific and technical subjects for the general public. Employed at the National Aeronautic and Space Administration (NASA) he has lectured on the international implications of ocean science and technology at the American and George Washington Universities.

Reviewed by Morris Kershner

Integral Animal Behavior by David E. Davis. "Current Concepts in Biology" Series. The Macmillan Company, \$1.95 (paper)

The current trend in the sciences of combining isolated fields of interest in order to gain increased insight, can have its own limitations. The subjective nature of sociology and its counterpart in animal behavior studies can increase the difficulty of making objective interpretations of laboratory and ecological studies. In *Integral Animal Behavior*, the author's subjective feelings on the course of action man should take to alleviate over-population, influences the supposedly objective viewpoint of animal behavior presented in the non-speculative part of the book.

The author's major contention is that the evolution of behavior mechanisms has increased the adjustment to the environment by the total population of the species while decreasing the adjustment made by individual members. Furthermore, this has resulted in greater independence from the environmental conditions inasmuch as behavior patterns which organize a population into an integrated unit also isolate it from the environment. More highly evolved forms have increased their sensitivity to other organisms rather than to environmental conditions. Examples of this are given throughout the book as evidence for the role of behavior in adjustment. It is this sensitivity, the author tells us, which allows non-genetic transmission of information to aid the population in shaping its single integrated response. The dance of the scout bees on returning to the hive is one form of this. The insurance that high ranking members of a population—that is those best adapted to a particular environment—will produce progeny, is another form of the same adjusting process.

The author points out that these two patterns differ in one major respect: The bees have achieved an organization through division of labor which is mutually beneficial to all members of the population. Their ability to control environmental temperature within the hive serves all the members of the population. The animals who have developed territory and social ranking forms of organization do not all derive equal benefit from it. Rather, these mechanisms

work to preserve the population as a whole by behavior which accentuates conflict between individuals and forces them to compete for the right to reproduce.

The advantage of inducing conflict is not readily seen and the author's attempt to connect the advantages of this type of organization with control of the environment leads to some confusion. For any particular environment there is an optimum number of individuals which can utilize it. Exceeding this number may result in the starvation of juveniles that have undergone some development and whose loss represents a waste of energy which could have been used by other members of the population. Any mechanisms which regulate the reproductive rate so as to maintain the maximum utilization of energy enhance the population's chance of survival.

The author defines such devices as negative feedbacks from their similarity to the automatic computer devices of the same name. Apparently, the ability to control that aspect of the environment which is most significant to a population, namely itself, is the analogy the author intends to point out. Positive feedbacks are those which tend to increase the reproductive rate with increasing population density. They are responsible for such extreme fluctuations of the population that they result in extinction of the species. Hence, we can have no example of this occurrence. There is however a behavioral mechanism which mitigates the direct effect of negative feedback in that it causes dispersal of the losing member of a conflict instead of immediate death. In this way, individuals in a temporary disadvantage in one environment are maintained to repopulate the species should the environment change. The author has traced the evolution of a tendency to seal off the outside environment. Once this is done, it remains for life to find more reliable means of controlling the internal environment. On the population level, this process is called feedback. In his discussion of man's behavior, the author implores mankind to introduce consciously negative feedback to prevent overpopulation. He feels that man has reached a plateau in his technological capacity to control the environment. Optimistically he sees the uniformity and lack of innovation which an absolutely negative feedback system would involve.

While the author grants that some of his work is speculative and is not backed by experimental evidence, he fails to state that all the material in the objective part of the work was selected for its agreement with his speculations. The importance of increasing the number of different species is minimized. What part this plays in causing behavior patterns which force selective adaptation is

an unanswered question. Perhaps the author's idea, that a totally stabilized world where evolution has stopped, is valid. But those aware of man's tremendous dependency on the environment cannot envision a day as yet when evolution could stop without having serious ramifications. There is a close parallel with overrating man's technological abilities and the author's viewpoint that various animals have achieved any significant degree of control over the environment. While he states many times that one should not do so, he is guilty of minimizing the lack of success in this area. The knowledge that behavioral organization breaks down whenever the population is in danger of extinction, that animals initiate negative feedback even when the population is below optimum level, that man's behavior is very much the product of instinctive drives, and that conscious attempts to circumvent them are exceedingly dangerous are all ignored by the author. He states that evidence is just waiting to be found which will support his theories. This type of thinking limits the reader in exploring other interpretations. In fact, recent evidence seems to indicate that man has not even evolved to the point where he can mitigate the direct effects of negative feedback. Viewed in this light as a book which presents one particular hypothesis, it does accomplish its purpose of stimulating further reading and thinking in the area of animal behavior and its relationship to man. Many concepts are new and need further exploration. The author's attempt to stimulate it is appreciated for the difficulty in the lack of information and consensus of scientific opinion which he encounters in writing an exposition of this type.

—Reviewed by William Bear

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PROCEEDINGS

Staten Island Institute of Arts and Sciences



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Editor: G. K. Schneider

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attention of the Editor.*

ABSTRACT: Ward's Point, Staten Island, N. Y., has been used for many centuries, first by Indians, later by the colonials, as a place to fish, to settle, to boat, to farm, and from which to ferry to the mainland. In recent years much of the area has lain fallow—abandoned by householder, farmer, and oysterman alike—because the pollution, both water and air, of the past eighty and more years, made the use of the natural resources increasingly unprofitable. Today Ward's Point is the focus of interest of many conflicting plans of development. Part Two of this article poses the question whether two conflicting lines of development can be planned in this small geographical area and suggests that development be limited to that of a unique park with water improvements to protect this park.

Changes at Ward's Point, Staten Island

PART ONE

At the southern tip of Staten Island, which is also the southernmost point of the State of New York, is an area known as Ward's Point. It was named for the family of Samuel Ward, who, in 1788, bought from Colonel Christopher Billop, 273 acres of land from which Ward operated the ferry between Tottenville and Perth Amboy.

Before the advent of the early colonists, Leni-Lenapé Indians were frequently encamped here. They raised corn, hunted the woodlands and fields for deer and birds, fished the bay and gathered shellfish. Clam shells were made into wampum and traded with other Indians. The marshlands nearby provided reed grasses which the squaws made into grass mats. Raccoon, opossum, muskrats and squirrels furnished not only food but also pelts for clothing. In this manner perhaps 100 Indian families lived here during the summer. In winter they moved inland to escape the cold winds. There may have been some skirmishes between different tribes.

All this information was deduced from the approximately 40 burials unearthed by a number of investigators during the 1890s. The Cole and the Decker families owned land in the area and dug on their own properties. Capt. R. D. Wainwright and George H.

Pepper helped to excavate for the Staten Island Museum. Dr. Max Bedell also worked on his own land. As recently as 1960, Jerome Jacobson, an archaeologist from Columbia University, found the skeleton of a squaw which is at present on display at the Museum. Some of these skeletons had fractured skulls and other broken bones. Skirmishes between tribes might account for these. One skeleton was found with a piece of glass and some Dutch pottery, leading us to believe that the Indians were still here when the early settlers came.

Many shell heaps were also found, mostly of discarded oyster and clam shells, and included scraps of flint and discarded spear and arrowheads. The Conference or Billop House, a historic landmark at the end of Hylan Boulevard, has on display over 300 pieces of spearheads, arrowheads, pottery fragments and human bones found in the area. Some are in the possession of the Staten Island Museum, others are with the American Museum of Natural History.

At the Conference House the first peace conference during the American Revolution was held September 11, 1776. It brought together Lord Howe, Commander of the British forces, and Benjamin Franklin, John Adams and Edward Rutledge, representing the Colonists. Since the Colonists did not wish to surrender to the British, this conference was termed a failure.

Ward's Point juts into Raritan Bay and Lower New York Bay. Raritan Bay is formed by the confluence of the Raritan River and the Arthur Kill. Salt water from the Atlantic Ocean flows between Long Island and Sandy Hook, to mix with fresh water from the Raritan River and other streams. Therefore the water is brackish, the amount of salinity being determined by the amount of water run-off from the land. The mean tidal range is 5.5 ft. The circulation and tidal flow make this a rather sluggishly draining estuary. It takes between 32 and 42 high tides to flush a given quantity of fresh water from the mouth of the Raritan River to the Atlantic Ocean. In December 1948, 60 tides were required to flush the entire estuarine system. Because of this sluggish flow, any pollutants introduced into the bay stay around a considerable time.

The land mass on the coast of the Middle Atlantic States appears to be sinking slowly. Subsequently salt water has invaded to a much greater extent the usually fresh water of rivers and streams and estuaries. Wave action, rain, and wind are gradually eroding the soil. Sand of course washes away easily but the glacial clays underlying the terminal moraine tend to remain in place longer. In spite of this, large trees have been undermined by the waves,

but this may have been assisted by the killing action of increased amounts of salt water on the tree roots.

The Tall Reed, *Phragmites*, has a very tough and tightly interwoven root stock and some of the soil held by these plants is more resistant to erosion. The map of 1874 shows the docks of Butler's Shipyard, which are now washed away except for a few buildings. The same fate overcame the dock installations of a yacht club just west of Butler's docks. A fort was hurriedly constructed during the Spanish-American War on land, but only at low tide can some of the remaining concrete blocks be seen.

During Mayor Hylan's administration in the 1920s, Hylan Blvd. was cut through to Raritan Bay, and from it a network of streets was laid out, complete with sidewalks. This was to encourage real estate development at the southern end of Staten Island. The streets and sidewalks closest to the waterfront have been badly eroded, the sidewalks heaving their concrete blocks at curious angles, or lying completely broken up as chunks of concrete on the beach. Oyster shells, a cheap material for road building along the beachfront, were used in the construction of the roads, and these shells are now becoming exposed. At times they are confused with Indian shell heaps; however, the complete absence of artifacts and the inclusion of much broken glass lead me to believe that this was the roadbuilding material.

Any construction, such as the shore front drive contemplated by certain city planners, or any buildings, such as a beach house or dock or marina facilities, would, in this process of erosion, be endangered. The shore front drive would have to be set back from the beach a distance, hence the view would be obstructed by vegetation. Since trees and shrubs do slow shore erosion to a certain extent, it would be even more fatal to cut away this vegetative cover. The deposit of a large amount of boulder material, another method of preventing erosion, would impede the enjoyment of swimming or picnicking in this area as it has at Prince's Bay Light. Before any construction gets under way, the planners would do well to look at the problems encountered at the beach house at Great Kills Park or at the Pavilion at the foot of Hylan Boulevard.

The bluff at the end of Hylan Boulevard is part of the terminal moraine, detritus from the Wisconsin Ice Sheet. Among the rubble are rocks from many a northern locality. Many of these rocks were rubbed smooth by glacial action. The soil and sand between the rocks is of a reddish color, an indication that it contains iron oxide. Imbedded here can also be found iron concretions. Strata of glacial clays, some yellow, some gray, and some almost black underlay the

glacial till. For geologists this is an interesting area, because there are always new exposures of rocks as erosion wears away the bluff a little at a time: sandstones, shales, iron concretions, quartz, and granites, appear. The glacial clays are an extension of the clay deposits found at Kreischerville and in Perth Amboy, New Jersey. Material from these deposits has been used for the manufacture of brick, terra cotta, and clay pipe.

In former years a number of plants grew in the Ward's Point area that have become scarce or can no longer be found here. Cedars formed large groves near the Billop House and further toward the point. These have been eliminated by industrial fumes which sweep over Staten Island from New Jersey. Swamp Magnolia bloomed in the wetter woodlands, and pink Lady's Slippers and white Lady's Tresses bloomed among the shrubs. Trailing Arbutus was considered common during the latter part of the last century, but at that time ladies came with baskets and pulled up the plants to make bouquets. There is only one small area left where this plant can still be seen on Staten Island in the vicinity adjacent to Ward's Point.

Fire also played an important part in the eradication of our native plants. As we walk or drive through the area today we find many dead tree stumps still sticking up, reaching skyward among the catbriar and bracken fern tangle. Only the more fire-resistant trees and shrubs have been able to survive.

Oystering and clamming were flourishing businesses in the Raritan and Lower New York Bays during the 1800s. About 1850, 150 families depended for their livelihood on the raking of clams and oysters from the bay, transferring the oysters to floats, moving them to fresh water for a few days to become plump, and then ferrying them to the New York City market. Other people were employed in the building and maintenance of boats and floats needed in this industry. Competition was keen between the oystermen of Staten Island and those of New Jersey and at one time the two factions almost came to battle. This thriving business came to a halt when the waters of the bay became polluted by sewage and industrial wastes. Typhoid was one of the diseases carried by shellfish, and in 1916 the New York City Department of Health declared shellfish from New York Bay unfit for human consumption. In 1940 the waters were considered cleaner and oystering was resumed. During World War II the bay became polluted again and clamming and oystering is still forbidden. As this industry ceased, the shipyards that had provided the boats stopped operating and people began to

move away. Some of the houses in the area, untenanted for long periods, were later destroyed. Remaining are some of the plants the inhabitants had introduced into their gardens. Some of these are spreading while others are just holding their own in the competition with our native species. Moonseed, a vine, covers many shrubs and trees. Heart-leaved Umbrellawort, a flower from the middle west, grows along the roadsides. Paper Mulberry, which was introduced by someone trying to raise silkworms, is spreading.

Today, the area has a slightly deserted look, streets with overgrown sidewalks and vacant lots thick with trees and shrubs. There are a few residences, nicely landscaped with lawns, trees, and shrubs, and Silver Maples growing along the sidewalk.

One of the dominant trees in the wooded area is the Hackberry, with its witches' brooms. Others are Carolina Poplar, Large-toothed Aspen, and Pin Oaks, easily recognized by their drooping lower branches. Many of these trees are heavily overgrown with Honeysuckle, Moonseed and Virginia Creeper, making an almost impenetrable thicket. Poison Ivy is another vine which will tend to stop you from leaving the pavement to enter the woodlands.

At one point there was a brook running in a north-south direction from the north side of Hylan Boulevard to the bay. Possibly because of the long years of drought, this brook has dried up, and its swampy banks are overgrown with Tall Reed. When Tall Reed grows in such profusion other plants cannot flourish and are crowded out by the dense tangle of heavy root stocks.

The streets at Ward's Point are bordered with roadside weeds, many of them originally brought from Europe by early colonists, either as garden plants or, by mistake, with other seed. Thus we have Queen Anne's Lace, Yarrow, Bouncing Bet, Great Mullein and Cow Parsnip.

An occasional high tide reaches up onto the sandy beach and inundates the area with salt water, aiding the growth of halophytes which help to prevent beach erosion. Sea Rocket, Prickly Glasswort and Beach Grass are among the species of halophytes found here.

During the spring and fall migration the beach is a haven for shorebirds, which rest and feed before continuing their flight. Bird-watchers can find Sanderlings, Least and Semi-palmated Sandpipers, Knots, Dowitchers, and Ringed Plovers. These spry little birds follow each wave in and out, searching the sand and mud for shrimp, prawns, and worms before these can bury themselves in the sand. Common and Least Terns, and sometimes even Black Terns, skim above the water, suddenly diving to catch an unwary

minnow. In early fall some of these can be seen feeding their young, which sit screeching on the beach.

In the summer a Kingbird may be seen surveying his territory from the top of a tall tree, frequently darting after a dragonfly or other insect. Rough-winged Swallows have been known to nest in a hole on the bluff, and Barn Swallows skim over the jetsam on the beach, catching flies.

When the berries are ripe on the many Hackberry trees, at the time of the Fall migration, flocks of Robins, Catbirds, Cedar Waxwings and Towhees, Thrashers and Bluejays stop long enough to feed before they set out across the bay to New Jersey. Tree Swallows and Myrtle Warblers can be seen even in the wintertime, hunting for berries in the bayberry bushes.

The bay is a refuge in the winter for the many ducks that have fled the frozen lakes in the north. Scaups, Goldeneyes, Buffleheads and Black Ducks gather here, since they feel safe in an area where gunning is prohibited. The gulls are the scavengers, and our beach would be much dirtier and smellier if the gulls did not feed on the dead fish and shellfish washed up by the waves.

During the summer and particularly on the weekends the beach is used by many bathers, fishermen, and picnickers, although it is not a very clean beach and the water is quite polluted. At times oil floats in on the water, leakage from a tanker or some refinery. This oil, being washed in on the high tide by the waves, covers the beach and every living and dead creature on it. A tarry coating attaches itself to everything, choking up the breathing holes of the clams and worms living under the sand, as well as killing the creatures living on the surface.

During the winter, oil film on the water gets caught in the feathers of ducks, loons, grebes and gulls, which winter here, believing they are secure from harm. This oil causes them to lose buoyancy and they are no longer able to dive for food, swim well under water, or fly. Many hundreds of ducks perish each winter from just this cause. Attempts to cleanse oil from the feathers have been relatively unsuccessful, particularly on such a large scale.

Others sources of pollution are the many sewers and pipes bringing industrial waste to both the Raritan River and the Arthur Kill. A large trunk sewer in the Raritan Valley gives only primary sewage treatment, and then discharges this outfall from residences and businesses into the head of the bay. Fish and shellfish have greatly decreased in number since the beginning of World War I. Fishing and swimming sports in these waters are not encouraged.

Another menace to marine creatures is off-shore dredging. The

Corps of Army Engineers is continually widening the channel and making it deeper for navigation. This exposes many of the clams that otherwise would be living below the surface of the sand. They are then easy prey for their enemies and are readily tossed up on the beach by waves. Since worms, shellfish, shrimp and prawns are food for our own food fishes, as well as ducks this broken link in the food chain, yes, even man's food chain, could be of serious consequence.

What, does the future hold for Ward's Point? Tentatively it has been set aside for park purposes. As a park the waterfront could be developed for swimming, but only *after* the water pollution has been cleared up. A boating marina could be established; however the shipping channel for tankers is very close to shore here, and arrangements need to be made for boat safety. There is space behind the beach for ballfields, but these should not be erected in an area of good woodland. Picnicking should be encouraged, but the littering problem must be solved. At present much of the area is abused by dumping. There is room here for birdwatchers, hikers, and botanical study groups and for walking and bicycling trails. With the proximity to the Outerbridge Crossing and many major highways, this could be one of New York City's most attractive parks.

Another tentative plan is that of a shore road. Taking into consideration the amount of erosion which continually occurs, such a road would have to be laid out at a distance from the shore in order not to succumb to erosion in the near future as was the case with Surf Avenue. A road placed at such a distance would interfere with the use of the land for other park purposes, as well as being placed too far away from the shore to offer any prospect consonant with its name.—*by Mathilde P. Weingartner*

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PART TWO

Ward's Point today is the focus of conflicting plans in preparation by several agencies and groups. This tiny area has taken on the function of a pawn being held in reserve for a future play—to what side it will go is still to be decided.

This area is studied and described in the Army Engineers' report on "Staten Island, Fort Wadsworth to Arthur Kill, New York, Beach Erosion Control Study," which was officially released in 1965. The accompanying maps are reproduced from this study. Abstracting this paper the following outline emerges:

The Problem cited is of a high degree of physical damage due to hurricane and other storms and erosion along the 13-mile south and east shores from Fort Wadsworth to the Arthur Kill (Tottenville). Hurricane damage is caused principally by tidal flooding. Storm tides, created by high winds and accompanied by wave action, have inundated large developed areas and wreaked much property damage. Such storms have also eroded the beach considerably, causing an average loss of about 4 cubic yards per linear foot of shore per year.

Natural Factors: Storm History. Between 1635 and 1962 a total of 239 storms (hurricanes, tropical, extra-tropical) is recorded to have affected the entire study area. Of this total, 7 were described as unusually severe; 25, as severe; and 98 were described as moderately severe. Tidal flooding as well as wave action affects this area from the Atlantic as well as from the bay through the gap existing between Sandy Hook and Rockaway Point.

The study area lies in part of the unsubmerged Coastal Plain which extends along the Atlantic seaboard. Conspicuous features of this area are its tidal marshes and shallow bays. Along the coast of the entire study area Cretaceous and Pleistocene deposits are present. The Cretaceous deposits consist of layers of silt, clay, sandy clay, sand, and gravel to a maximum thickness of about 300 feet. These deposits are said to represent the Raritan Formation which is seen in Southwest New Jersey. The Pleistocene deposits overlay the Cretaceous sediments and principally are made up of the terminal moraine and deposits from the outwash plain generated by successive stages of glaciation.

The composition of the terminal moraine is chiefly of a relatively impermeable and unstratified mixture of clay and sand combined with boulders of sandstone, diabase, basalt, granite, and gneiss. The maximum thickness of the moraine is about 75 feet.

The area of Ward's Point lies within the southernmost part of the terminal moraine.

The examination of littoral materials is needed to understand the problems to be faced in halting beach erosion. Based on the result of mechanical analyses of bottom materials, the entire south and east coast of Staten Island was found to consist chiefly of fine and medium gravel sands with little fluctuation. Generally samples taken from the area between Crooke's Point and Tottenville displayed higher median diameter values than those taken east of Crooke's Point. In any case the littoral materials naturally available were adjudged to be of the quality that resist accumulation. In addition to this lack of cohesiveness, the littoral forces, which are waves, tidal currents, winds, ice and tides, affect the movement of littoral materials.

Waves enter the opening between Sandy Hook and Rockaway Point in addition to those generated by local winds. Waves evidently tend to work in from the Atlantic and up the Staten Island coast to Arthur Kill, causing an obviously eroding action. Fresh water from New Jersey rivers and streams is said to follow the contour of the Jersey coast down to the Hook. Waves are generally modified over most of the area by refraction and shoaling, although swells of 15 feet have been observed after severe storms.

The *tidal current* of the Arthur Kill at Perth Amboy, New Jersey, is 0.9 knots at flood and 1.0 knot at ebb. At other points in the bay, currents are less.

The *wind velocity* is a principal factor in causing inundation of coastal areas and damage by wave impact. High velocity on-shore winds pile up water against the coast and create high waves which break on shore. During the worst storms which have been recorded, wind velocities ranged from 35 to 99 miles per hour.

Ice conditions pose no problem in this area. *Tides* are semi-diurnal and have a mean range of from 4.3 feet at Fort Wadsworth to 5.3 feet at Tottenville. The spring range is from 5.2 feet at Wadsworth to 6.3 feet at Tottenville.

Shoreline Erosion: The greatest erosion occurred along the entire south shore, according to this study, during earlier periods. In the area of Ward's Point the study presents tables indicating that in the latest period examined (1933-1961), high water shore line changes continued causing a recession of 12 feet during these years in spite of the fact that, according to the footnote, 80,000 cubic yards of artificial fill had been added to that area during that time. In fact, ever since the first records of changes in high water

shore lines were taken in 1836, the combined total of shore line recession was estimated to be 108 feet by 1961.

Suggested Solutions: Construction of dunes, 25 feet wide at top, with an elevation of 15 feet above mean sea level (MSL), for protection against tidal inundations, plus a 100 foot berm at an elevation of 9 feet MSL. A beach slope of 1 in 20 was selected as best approximating the natural beach slope.

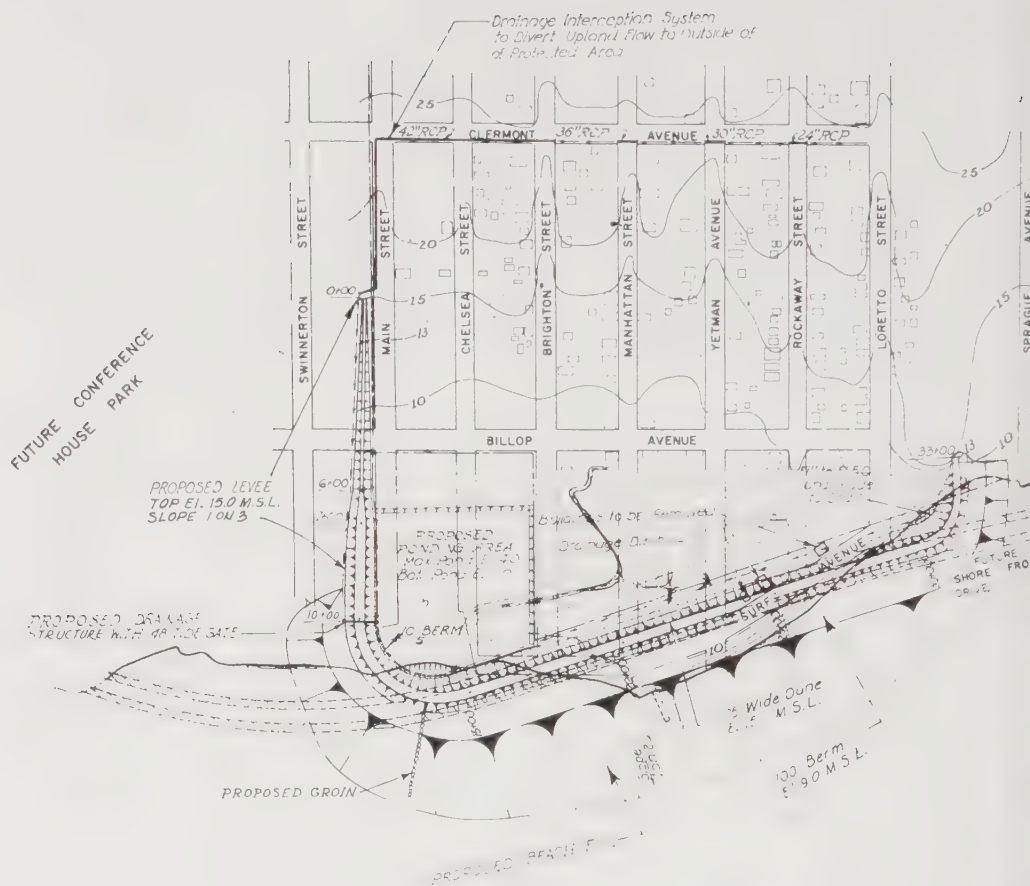
There would also be levees with a top elevation set at 15 feet above MSL, and interior drainage facilities have been designed to handle a ten-year storm in the vicinity as well as the seepage which occurs during a hurricane.

A stone groin is designed to hold the beach fill at Tottenville Beach. The length of the groin would be 360 feet. Dune and beach fill would be provided from high ground between Sprague Avenue and Loretto Street to Main Street, a distance of 2,300 feet. The beach fill would have a minimum berm width of 100 feet at an elevation of 9 feet above MSL and a foreshore slope of 1 in 20. The dune would have a top width of 25 feet at an elevation of 15 feet above MSL and side slopes of 1 in 5.

The groin would have a top width of 8 feet and an inshore elevation of 9 feet above MSL for 100 feet of its length. A sloping mid-section and off-shore section with an elevation of about mean high water (2.6 feet above MSL) would be provided at the west end of the fill. The groin and dunes would be tied into high ground by 1000 feet of levee with a top elevation of 15 feet MSL and 1 in 3 side slopes, and a top width of 25 feet for a distance of 600 feet from the shore. After a transition of 100 feet the top width would decrease to 10 feet to the end of the improvement. A ponding area with a drainage structure and tide gate would be provided for the storage of the interior drainage intercepted by the proposed work.

Comment and Questions

The above is abstracted from the Corps of Army Engineers' paper on the subject. The study states that the greatest erosion occurs consistently east of Ward's Point. The placement of the groin at the west end of the area designed for fill is expected to allow it to build up with littoral materials to maintain the dune. However, the available littoral has already been described of poor quality for accumulation purpose. There is also the danger that the groin will trap pollution, which is also conceded within the report. In light of these two predicted weaknesses it seems



Raritan Bay

NOTE
 1. WIDTH OF LEVEE:
 10 FEET FROM STATION 0+00 TO STATION 6+00
 VARIES FROM STATION 6+00 TO STATION 7+00
 25 FEET FROM STATION 7+00 TO STATION 10+00

Details of considered improvements at Tottenville Beach, N. Y. (Figure J7, U.S. Army Engineer District, New York, November 1963, reproduced from House Document No. 181, 89th Congress, 1st Session)

imperative that hydraulic tests be conducted, as directed in the report, and that experiences of other states be consulted. In addition, a question is in order about the effect of such a groin on the circulation of the water in Raritan Bay which is sluggish to begin with. What will be its effect on the outfall of the Arthur Kill into the bay? It has been abundantly proven by the Interstate Sanitation Commission that the water in the Kill moves so slowly as to build up a continually increasing slug of pollution.

Miss Weingartner's article (see page 40) states that it takes from 32 to 42 high tides to flush a given quantity of fresh water from the mouth of the Raritan River to the ocean.

The offshore section of the groin, which is stated to be at mean sea level, would provide a hazard to small boats and would necessitate additional channel markings. It would be better to increase its height so that under normal conditions it could be seen by boatmen as well as used by fishermen, presuming that the health of the waters can be restored for safe fishing.

The repeated dredging of the ship channel which is continually undertaken in order to keep open lanes for tankers should also be taken into consideration as one of the reasons for the continual erosion. Ward's Point has continued to lose feet of beach by erosion in spite of the fact that fill has been added. Erosion by storm action occurs less in this area than in the area around Crooke's Point and South Beach; therefore there must be additional factors included in the description, such as the aforementioned dredging. Dredging would eliminate the hope of ever reviving the shellfish industry of the bay, since, as pointed out by both the Federal and State Fishery Biologists, dredging 2000 feet off-shore will destroy seed-beds and future bed locations.

The recently threatened dredging of littoral materials by private dredgers for use in state and federal projects in other areas would also have removed totally the footing for these beaches and destroyed the possibility of their regeneration. Waves are broken by interference from offshore sand. If this sand is removed, there will be no natural obstacle to decrease the force of waves.

Dunes have a way of moving, mostly landward. Planting of proper vegetation must be planned and carried out in order to hold them in place.

As to the proposed shore road, which is, according to this Report, not finally designed, this has variously been described as an additional protection against erosion and as a scenic route. The charts printed along with this document indicate its route. Within the report certain relationships to beaches and verges are laid down. The roadway would be located a minimum of 24 feet from

the landward edge of beach slope, which would in turn *protect* (our italics) the highway. It would be built on an embankment with a minimum top elevation of 11 feet MSL. The map of Ward's Point shows the roadway bridging over water at one or more points as it rounds the Point itself towards the Outerbridge Crossing.

In criticism, we point to the remains of roads and sidewalks which have been broken up to fall onto the beach by the action of erosion. A road cannot prevent erosion unless its engineering is so strong and steel girded that the area becomes useless for any other activity except a roadway. A minimum elevation of 11 feet MSL seems very minimum indeed. How can this insure the road against inundation during extreme tides or tropical storms? The location of an active roadway as close to a beach as 24 feet would make the beach itself unpleasant, noisy, and distasteful to recreation-bound people. Yet if the road is placed further inland it can hardly justify its description as a scenic shore road.

We suggest that the Report on "Staten Island Development" by the City Planning Commission should be carefully studied. The following is quoted from that report:

"These prevailing sentiments notwithstanding, the Planning Commission would not recommend the acquisition of lands on the South Shore below Great Kills Park for the purpose of extending the Shore Front Drive. It has been argued that this facility is needed so that it can be tied into the necessary beach erosion and hurricane protection programs for this area. The Commission would urge that the City move ahead with its plans for beach protection but that the matter of a roadway be abandoned because it would be detrimental to existing and proposed development in this desirable shorefront area.

"The Planning Commission does not share the view that an asphalt barrier is a requisite part of the City's seascape. There are areas of the City—and South Richmond may very well be among them—where land and people might touch the water without the intrusion of a major highway. Recognizing that very often the purpose of such highway acquisition was to insure that the waterfront would remain in public use, we would suggest that these same commendable aims be achieved through a park acquisition program or through a conservation effort.

"We would recommend that instead of the Shore Front Drive continuation (whose traffic demands are not yet demonstrated), the City redesign the Hylan Boulevard widening south of Great Kills Park to develop it as its name implies—as a first class boulevard—with adequate service lanes to handle commercial vehicles and wide, landscaped malls to enhance the general tone of development along the route."—page 48, *op. cit.*

"Along the southern portion of the shoreline between Great Kills Park and Tottenville Beach, little if any hurricane protection improvements are needed; rather, prime consideration has been given to protecting

the beaches from the erosive action of tides and milder forces. The roadway would not contribute to this aspect of the project and therefore no cogent reason exists for extending the Shore Front Drive along a route immediately adjacent to the beach south of Great Kills Park. Moreover, by realigning the roadway to a point further inland, a greater portion of the seaward land could be saved for recreational use.”—page 62, *op. cit.*

This proposal has since been endorsed by the Park Association of New York City (March 1967).

The important question of pollution is not really answered anywhere in the engineers' study. This study implies in its body that action is being taken to clean up the area, yet on referral to the proper appendix this implication is not supported. The Report by the City Planning Commission (*op. cit.*) admits that it will be many years before pollution is actually controlled in the area, although plans are on the drawing board for primary and secondary treatment plants.

The situation is, however, not alone up to the City of New York to solve. Interstate cooperation is necessary since New Jersey outlets flow into the Arthur Kill and into Raritan Bay.

One most effective way of beginning to clean up the bay would be to remove heavy shipping channels altogether. The addition of bilges and oil tank cleanings to water already heavy in sewage and industrial pollution makes ordinary water recreation impossible.

In the ten years since the first public hearings were conducted on this study in 1956, the regional population has moved at a greater rate than predicted; government projects do not move as fast, which is fortunate in this instance. There are recent changes in geographic usage. The whole region of the South Shore was said to serve a population of 4,000,000 at that time, taking into account use of the facilities by tourists, visitors from other Boroughs of New York City, and from towns in New Jersey, as well as use by the resident population.

Since then many small communities on the Jersey shore of Raritan Bay have developed; the Verrazano Bridge has been opened to traffic from other Boroughs and from Long Island. The vehicular traffic has increased, and although the majority of the off-Island traffic is using the Island as access to the south or north, a percentage of it must necessarily be Island-bound.

The Engineers' Report assumes that the area will be used for both recreation and for shipping. For the future, it is our opinion, a decision will have to be made for one or the other use. There cannot possibly be room enough to develop both.

The recreation needs of Staten Islanders translated into the available park acreage (12.7 percent of the total land mass, against a New York City average of 17 percent), indicate an immediate need to acquire land for parks in the face of the current land speculation and before it is too late. The City Planning Commission places at the top of its list for acquisition funds for parks, the addition to the Conference House Park which is set down at 268 acres with an assessed valuation of \$1,604,800.

Most of the protection outlined for Ward's Point is being done to protect developments adjacent to the point only and nothing is described in the Engineers' Report which includes protection for the park and the park addition. This park addition also raises urgently the question of the shore drive and its relation to the entire park area.

In the improvement of Conference House Park, the heritage of the area as described in the foregoing article should be developed and preserved. The construction of a shore drive through the area would destroy most of it.

The proposed purchase of 268 acres (little less than Ward's original purchase of 273 acres from Colonel Billopp), would allow Conference House Park to be developed as a unique park including a recreation area and an archeological as well as historical preserve.

The archeological discoveries which have continued over a span of eighty years have given rise to the name, "Burial Ridge," for the location in which most of these discoveries have been made. This locality is still in the opinion of professional archeologists, rich in material relative to the habitation of the Indian on Staten Island. The preservation and fencing of this portion of the parkland as an active archeological site for which permits could be issued for exploration by students of archeology from New York and New Jersey should be considered.

The greater part of the park's acreage could be developed into a fine recreational and picnicking area, becoming in time one of the most attractive parks in the region.

The *Staten Island Advance* editorialized on March 28, 1967, that "The time to discuss, to plan and to decide is now [regarding the proposed change from the Shore Front Drive to a widened Hylan Boulevard at the south end of the Island]. Staten Island cannot afford to find itself in another bind similar to the one in which it finds itself regarding the [Richmond] parkway."

Planning, which has been completed on the drawing board in the 1950's and which is put into effect ten years later often is found to have become inadequate. One example of obsolescence is that

of the Long Island Expressway which was planned in 1953 to carry 80,000 cars a day in 1970, and by 1966 was choked with more than 140,000 cars a day on weekdays to more than 170,000 a day on some weekends. Commissioner Barnes stated that it "was so poorly conceived" that no one knows what can be done about it now. (*NYT Magazine* p. 34, March 19, 1967).

It should be an intrinsic part of the process that all such planning should be subjected to scrutiny and thorough evaluation before it is put into effect. Not only should it be examined from the point of view of ability to fulfill its original function, but now a new quality must be considered: In the interests of open space for living, of environmental quality, of the improvement and easing of life for many, is this solution justified?—by *Harry Betros, Mathilde P. Weingartner, and Gail K. Schneider*

Postscript: The latest report on the state of the shore road describes a previously unpublicized plan for the road as the "fastest truck route" between New York City and Philadelphia. In order to fit this description, the road is planned to be built as a six-lane, limited access highway to be routed through Tottenville where an additional bridge would be built from the foot of Hylan Boulevard to span the Raritan Bay (*S. I. Advance*, April 23, 1967).

From the point of view of the above article this plan would destroy altogether the hope of having a true recreational area of unique character developed in this location. Further it will impede severely any community development of residential value. This latest proposal indicates the urgent need for thorough evaluation of total human environment for this island.

Series Concept of Species Of Aulacodiscus

by JOSEPH F. BURKE, JOHN B. WOODWARD AND WARREN E. FLINT

The diatom *Aulacodiscus orientalis* Greville, from the New Hebrides, is selected here to illustrate the series concept of a species. This concept has been advanced and discussed by Burke and Woodward¹ in their continuing review of the genus Aulacodiscus.

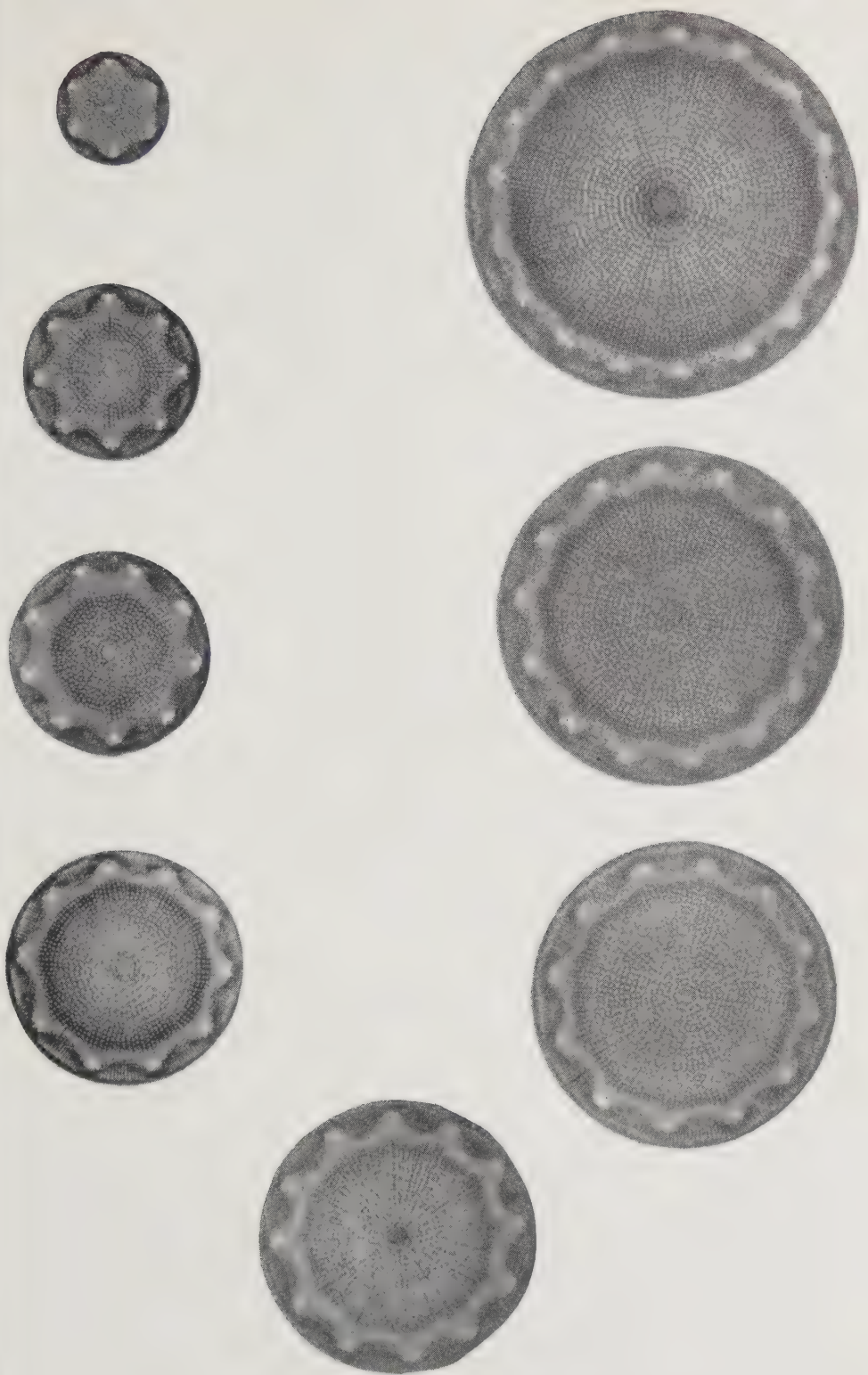
The series concept postulates that the characteristics of a species should be investigated and described through its full range of size with its variations according to size.

An important character of *A. orientalis* is the concentric arrangement of the areolae around the central space, or umbilicus. The series concept permits the elasticity needed to allow for the disappearance of this characteristic in the very small specimens. Tautness of concept applied to a species has resulted many times throughout the literature in more than a single epithet being applied to what are but differently sized individuals of basically the same taxon (taxonomic unit).

A desirable procedure is to collect specimens of all available sizes until a full series of a species is obtained. And, if opportunity presents, the series may be added to at either end of the size range. If there exists a holotype of the species and it is desired to make comparison with it, then from the series should be selected a specimen near in size to the holotype. Other specimens in the series, remote in size from the holotype, may offer unsatisfactory comparison therewith. But a step by step reconciliation within the series may be made between any individual therein and that other individual nearest in size to the holotype.

In the accompanying plate photomicrographs of a series of *A. orientalis* are so arranged that the eye may progress either upward or downward in the size scale. Also side by side comparison may be made between the largest and the smallest specimens in the series.

¹ A Review of the Genus Aulacodiscus, by Joseph F. Burke and John B. Woodward, 1963-1966, published by the Staten Island Institute of Arts and Sciences.



A. orientalis Greville (New Hebrides)

LEFT (from the top down)	CENTER	RIGHT (from the top down)
50 mu	120 mu	170 mu
75 mu		150 mu
88 mu		130 mu
105 mu		

COMMUNICATIONS

*Results of the Ranger, Luna 9 and Surveyor 1 Missions**

by HANS J. BEHM

(An article to be published in *The Journal of the Astronautical Sciences*, May/June 1967. The American Astronautical Society, Inc.)

ABSTRACT: This paper presents a discussion of lunar surface geology in light of information obtained by the U.S. unmanned lunar missions, Ranger and Surveyor I, as well as the Soviet mission, Luna 9. Characteristics of the lunar terrain are analyzed including roughness, distribution of rubble, craters, slopes, fracture structures, and bearing strength.

Previous predictions are refuted, modified or confirmed and new conclusions are reached. It is not meant as an attempt to settle the controversy regarding the origin and evolution of the surface features, i.e., craters, maria, and the highlands, but rather as an attempt to provide meaningful conclusions which will be useful in the vital selection of a manned lunar landing site.

INTRODUCTION: Prior to Ranger, geological knowledge of the moon was based on photographs and visual interpretations obtained from terrestrial observatories. But even the finest telescope is prevented from fully utilizing its resolving capabilities when hampered by the earth's atmosphere. As a result, numerous theories evolved about the lunar surface, which made any prediction of success for a manned lunar landing highly unreliable. Thus close-up photographs of selective lunar location were a mandatory prerequisite of Project Apollo.

1. Manuscript submitted November 1966
2. Advance Systems Department, Grumman Aircraft Engineering Corp., Bethpage, N. Y.

The Photographer and Conservation

The photographer can do a great deal to interest his friends and acquaintances in their natural environment, in the beauties of the out-of-doors, and in their preservation. The mere exposure of an audience to a travelogue showing interesting plants and animals, as well as splendid natural scenes, is of great value when members

* Lecture Meeting, New York Section, American Astronautical Society, Inc., October 1, 1966, at Staten Island Institute of Arts and Sciences.

of such an audience are asked to express their opinion about the construction of a dam, a throughway, or an electric power plant. Although I have never seen the splendors of the Grand Canyon with my own eyes, yet after seeing its unique and beautiful scenery in many movies and slides, I am thoroughly aroused by the thought of anyone even thinking of erecting a dam and threatening the beauty of this national monument.

Many pictures, many of them in color, have appeared in the press extolling the beauties of nature ("one picture is worth a thousand words"!), and this is one of the reasons the public is gradually awakening to its duty to preserve some of this vast and lovely country of ours.

The most interesting subject, not only to the photographer, is often a rare specimen of plant or animal. Although a daisy or a dandelion has a comeliness all its own, it is not nearly as much appreciated as the beauty of a Lady's Slipper or an Edelweiss. What makes some plants and animals so common that they may be classed as weeds or nuisance birds or pests? All such species adjust readily to many different situations in their environment, and have great ability to adapt to climatic changes. It is the lack of adaptability that makes other species rare or at least only common to a specific locality.

Let us assume that we are going on a field trip to photograph interesting subjects in nature. We plan to enter a bog where a number of rare orchids are in bloom. We should watch every step we take that we do not walk on any of these treasures. We refrain from picking any of these plants, not even to make up table-top or other such arrangements for the camera. Instead we must photograph each plant in its micro-niche.

But in the case of certain plants, for instance the Queen Lady's Slipper, which usually grow in the shade we will need to use a flash. If we can be sure that the small sapling which is in our way will spring back to its former position, we can gently bend it away from us. We must never break off a branch from a tree or shrub to allow the light to come through. This would change the light conditions for our Lady's Slipper for a long time, and very possibly the plant might die. Such species are very scarce, because they need a very special micro-climate. When you allow more light to penetrate to this kind of plant you also lessen the humidity in its micro-climate and make it possible for wind, with its drying effect, to reach the plant. Ask yourself before you arrange to take a picture of such a plant, "Will it survive after I leave?"

While you are photographing your rare specimen, what are you

doing to its neighboring plants? Are you standing, sitting, or even possibly lying on some choice plant? Look around you before you ruin this section of bog. Approach your desired specimen with consideration for its habitat and make every effort not to change or destroy any living specimen or disturb the natural environment.

In the woodland while taking pictures, possibly of some small plant, be careful not to disturb the woodland floor at the base of the plant. The forest litter serves a very special purpose by allowing rain to seep slowly into the earth and by keeping the earth moist on a dry day. If you have brushed it all away, you have changed that particular environment, possibly to the detriment of your plant.

A live snail provides an interesting picture. It should be photographed against a background of some moss, or in the grass. It may blend better with the environment and the contrast in the picture will not be as strong, but that is nature. The snail should never be removed to the sidewalk or placed on a stone in the sun. Such a location could be quite hot and its thin skin easily dries out from the heat reflected from such a surface. Worms, frogs, and salamanders also have thin moist skin which makes it difficult for them to survive high heat and the drying effects of the sun. The use of flash bulbs in shady areas is permitted because these give such a quick exposure that they do no damage. Photo-floods however are a different story since they emit a high degree of steady heat.

If you have moved your specimen while taking pictures of it when you are finished be sure to return it to its environment.

Birds and their nests pose another special problem: The mother bird will flush from her nest at your approach, not taking time to cover up the eggs or young with feathers or grasses the way she would if she left for a short time to get some food. Therefore, if it is a cool day, and you take a long time to get your picture, these eggs may cool off too much to survive. Some birds, such as the Cardinal, may not even try to come back if disturbed in this way. If you can get your light reading and adjust your camera before you close in on the nest, moving away as quickly as possible after you are finished, the mother bird can safely return to her eggs within a short period of time.

To close in on your picture it is essential that you do not remove any of the covering plants, branches, or leaves. Such an action will expose the young birds not only to the sun, but also to their enemies of which they have many.

Never remove the nest to a more favorable spot for photography. If the young birds are approaching the time when they first fly,

they will surely jump out of the nest, but may not be able to survive at such an early age. The parents may never return after the nest has been handled. Once the nest is removed from its location you will have great difficulty re-anchoring it in its former site.

I must admit that the judges who choose slides for awards do not always appreciate or understand the word "environment." They look for good lighting, good exposure, and good composition in a slide. If you are careful about the environment of your subjects in nature your slide may turn out not to have the best light, there may be a grass running through your picture and spoiling the composition, and time was too short for you to get the best focus, but you will have the satisfaction of having a real nature shot—a realistic representation of the plant or animal in its natural setting. You will know that you have not carelessly destroyed some interesting and beautiful living creation of nature.

Do all your slides have to be award-winners?

—M. P. WEINGARTNER (*October 5, 1966*)

New Age of Discovery

Within the decade, man has embarked not only upon preparations for the exploration—in person—of outer space, but has re-kindled his enthusiasm in the exploration of the oceans, sometimes referred to popularly as inner space. New technological advances have expedited both of these operations. It is the second of them that stirs the interest of the diatomist.

With improved methods of taking cores from the ocean floor, compared with collecting by dredging in the days of the Challenger, a historical approach becomes possible. Dredged species are perhaps largely those living today. By means of the core, former geological periods may be explored in the oceans. During the past century or more the exploring has been of land deposits. In the genus *Aulacodiscus*, fossil species are much more numerous than the living. The species lying in the strata below the seas may well exceed the number heretofore found in diatomaceous deposits of the land areas. We have to look only at a world map or globe and compare areas of land and water to comprehend this possibility. A potential enlargement of the fossil flora will be crowding us before a thorough review and revision of fossil marine diatom species are accomplished.—from page 131 (March 23, 1967), of *A Review of the Genus Aulacodiscus* by Joseph F. Burke and John B. Woodward.

(Publication of *A Review of the Genus Aulacodiscus* by Joseph

F. Burke and John B. Woodward was begun by the Staten Island Institute of Arts and Sciences in 1966. At that time, Fascicule 1 [1963-1965] was issued, followed by Fascicule 2 [1965-1966], each with its own index. Fascicule 3 [1966-1967?] is almost complete, page 135 having been published April 5, 1967.

(A *Review of the Genus Aulacodiscus* may be purchased by subscription only, as follows: text, per fascicule of fifty sheets, in advance, \$6.00. Non-profit societies may arrange for exchange privileges.

(Illustration plates are contemplated for later publication on a basis to be announced.)

Crisis in the Environment: The Scientist's Responsibility to the Public

This was the theme of a conference held by the Scientists' Institute for Public Information (SIPI) on May 12 and 13 in New York City. This organization was formed because the growing environmental pollution aroused scientists of varied disciplines to search for a method by which citizens could be informed of the risks being taken in the name of progress. Convinced that if the public is allowed to learn all the facts about the changes occurring in our environment, the citizenry will be in the best position to decide what they want and to provide action. In order to make facts available scientists have allied themselves with SIPI and have participated in their own communities as members of such information committees.

The public meeting which opened the conference presented a broad picture of the state of the environment today through the medium of three addresses delivered by Barry Commoner, Athelstan Spilhaus, and Rene Dubos. Dr. Commoner spoke from a previously prepared text, from a copy of which SIPI and Dr. Commoner have allowed us to quote. The other two speeches are reported by the Editor of this PROCEEDINGS who attended the opening session. Eventually the entire proceedings of this conference will be published, but its information and importance make advance reporting necessary.

Dr. Barry Commoner who is Director of the Center for Natural Systems at Washington University, St. Louis, Missouri, spoke on, "The Duty of Science in the Ecological Crisis." His purpose in speaking at this conference was made clear when he said: "I believe that we are approaching, in our time on this planet, a crisis which may destroy its suitability as a place for human society."

The balance of his speech was a review of some of his reasons for reaching this conclusion. He described briefly many of the assaults on the environment among which some are admittedly small scale, but he pointed out that because "of the complex network of interactions in the environment an intrusion in one place may exert its main effect in a distant locale . . . because of the peculiarities of the lichen-caribou-man food chain on which they depend, it has been the Eskimos and Lapps living in the Arctic Circle that are most seriously affected by worldwide fallout generated by these blasts [which originated in the Pacific atolls]."

He cited other examples of seemingly small-scale insults developing into large-scale accidents, among them DDT spraying and over-fertilization of surface waters through inorganic fertilizers applied to soils.

There are other pollutants that tend to remain localized so that their effect, such as carbon monoxide "in a densely travelled city, may be especially concentrated in a particular area."

It is shocking to hear that Denver, Colorado, which one has always thought of as noted for its clear and fine air, is now a victim of smog. Indeed, Dr. Commoner tells us that as the general level of air pollution rises, there is reason to believe that the incidence of disease associated with it will rise even more rapidly. Unless there is a massive national effort to halt air pollution and to attempt to gain again some sort of equilibrium, we appear to be heading for a biological crisis in this important area of the environment.

Man needs air first for survival, Dr. Paul Sears has said, and next he needs water. Water is also a vehicle (as we know) for waste disposal, as Dr. Commoner points out. When in balance, water can take care of a certain amount of waste, but overloads in the surface waters result in imbalances which in turn literally kill the vital liquid. "The first large-scale warning is the death of Lake Erie, where, as a result of the rapid accumulation of wastes, most of the central portion of the lake has gone to zero oxygen. The lake's life-cycle has been forced out of balance and what was, . . . a beautifully clear and productive inland sea in a decade has become a rank, muddy sink."

Finally—soil, which is a vastly complex ecosystem in itself. The city is tied to the soil through its food needs. In the past 25 years the use of inorganic nitrogen fertilizer has caused a massive stress of the soil ecosystem. These inorganic fertilizers tend to wash out of the soil during heavy rain; a part of this unused fertilizer drains into surface waters like rivers and lakes, while another part volatilizes and comes down again as a part of rainfall, washing into lakes

and rivers where it increases the inorganic nitrogen already present.

In summation Dr. Commoner warned: "The crisis in the environment reveals a potentially fatal flaw in the social use of modern science and technology.

"We have developed an enormous competence to intervene in the natural world: We can release fearful nuclear explosions, spray insecticides over the countryside, and produce millions of automobiles. But at the same time we are unable to predict the full biological consequences of nuclear war or to avoid risks to our livelihood and health from the side effects of the insecticides or from the smog that our autos produce.

". . . we have blundered into the accompanying hazards before we were aware of them."

One answer to the terrible promise implicit in these words, Dr. Commoner gives at the end of his speech: ". . . we have developed a new 'information movement' among academic scientists, designed to educate the public about the scientific and technological facts relevant to the major issues of the day.

"This is the alliance between the scientist and the citizen, which Margaret Mead has called 'a new social invention.' On this alliance depends the hope that the morality of man can, at last, turn the enormous new power that science has given us from the path of catastrophe toward the goal which is common both to science and humanity—the welfare of man."

Athelstan Spilhaus whose assigned subject was "Waste Management and Control," asked pointedly why we can take risks in war and not take risks which will save lives? Dr. Spilhaus is a geophysicist at the University of Minnesota. In 1966, as Chairman of the Committee on Pollution of the National Academy of Science, he was responsible for the report, "Waste Management and Control." Pollution is a big factor in causing people to flee the city, and to the pollutions to be enumerated he added noise, smell, and waste heat. He stated that two steps are necessary: the first one is urgent, but is still only an intermediate step, and has to be the control of pollutants at the source. The second step would aim at the complete recycling of the things we use.

America's economy is continually described as a consumer economy, but we forget there is no such thing as a consumer. Each person discards exactly what he gets. Think of him as a user. Therefore, if we plan recycling, we can collect his discards and then store and remine when related natural resources diminish or run out. As an instance, take the family car. After a complicated man-

ufacturing process which uses resources wrung from the earth, the car is used for a little bit, then abandoned. We might consider building a mountain of old cars which could be remined for ore in the future. (Dr. Spilhaus suggested this mountain could be covered with artificial snow and used for skiing in the meantime!)

However if we recycle, then we have to design for recycling. This means that we must consider what will be useful and not harmful in the soil, and keep in mind these considerations while planning recycling.

If the city is cleaned up, the city will regain its original purposes which are for living, recreation, schooling, and working. Zoning will no longer be necessary. In fact zoning has become necessary because the city has failed.

Finally we need to experiment with waste management and control, but this can only be done by means of an "experimental city" if we expect to get answers.

In discussion, Professor Spilhaus was asked to develop further the idea of the "experimental city." His reasoning is that the older cities cannot lend themselves to experimentation with new technologies because each system affects others (transportation, communication, etc.). We should therefore build a city *de novo* with complete facilities and with innovative plans, but still build for replacement and change. We need a prototype from which we can learn and adapt and we need to think of the city itself as a system.

The city would be populated and the citizens who lived there would be responsible for making their own choices as to what they needed and wanted from the city. All kinds of studies could be made of such a prototype but the most interesting one would be that of the way in which the people react to the choices which they would need to make. Today people do not know that they have choices.

The third speaker was Rene Dubos, professor at The Rockefeller University and pioneer in antibiotic research, whose subject was "Environmental Biomedicine: Neglected Research." Dr. Dubos pointed out that humans are enormously adaptable, even to the worst conditions. One implication of this adaptive ability is that although a person may accept and fit into a very traumatic environment, the statistical chances are great that this individual will suffer chronic disease as a result of this environment in not too long a time. He gave as an example a taxi driver whose work milieu is the crowded highway or avenue, saturated with gasoline fumes, yet who considers himself a successful individual because his pay is reasonably good and he is able to support his wife and four chil-

dren. During the day he will rail at the surrounding drivers and berate the traffic jams which keep him sitting penned in his cab inhaling fumes from exhausts. His immediate future may include incidence of chronic vascular or respiratory disease.

Dr. Dubos made the point clear that since we are not organized to study environmental effects on the organism, such a man may continue to function well at the time he experiences an environmental change or catastrophe, yet a later malfunction is exceedingly difficult to relate to this experience conclusively. He emphasized that no laboratory in this country could at this time conduct such studies—the techniques are not yet known, the experiments are not set up, the equipment is not designed.

Therefore he has reached the conclusion that we have to develop a new kind of science and also new scientific institutions which eventually will be able to follow an individual from gestation through succeeding generations in a study of environmental effects. This has been done in radiation study. Why, he asked, has this not been extrapolated for the study of environmental pollution? In answer, he gave one reason: In this country our scientific institutions are so organized that experiments are demanded which will give quick results within a few weeks or months whereas environmental study must be a lifetime study.

Parenthetically Dr. Dubos remarked that as a young man he worked as a sanitary engineer and although he has been out of that field for many years—he is now a microbiologist and pathologist—he was astounded to learn that nothing has been added to the understanding of waste disposal or of the transformation of sewage in soil or water within the past forty years.

In discussion, Dr. Dubos was asked "Must we have facts before we act?" In answer, he used the example of causes of air pollution in New York City. He pointed out that there are many causes and that some pollutants may combine with others and change. Some pollutants may cancel out the effect of others. In order to act to rid the air of the most harmful effects, we must know all of the facts and we will then need to establish priorities so that those which are most objectionable can be eradicated primarily. For example, changing from gas engines to electric ones will not alter the fact that colloidal matter from tires and brake linings is found among particulate matter polluting the air. This matter might be more harmful than nitrous oxides. We don't know yet.

In answer to a question about what kinds of animals would be used in environmental experiments, he mentioned three possibilities: a) Exposure only once of a newborn mouse to city air increases

the possibilities of cancer very very greatly in the mouse. b) Aging hogs develop vascular disease similar to that which man develops. c) Chronic pulmonary diseases like emphysema are very difficult to study since they are not easily developed in laboratory animals. However emphysema has been observed in horses.

These are some of the animals which could be used. The biological effects and, more important, the behavior effects of "crowding" should be studied.

The programs planned for the balance of the conference included reports from groups of scientists associated with the Scientists' Institute for Public Information who have been identifying local points of environmental stress and informing their own communities about them. How this scientist-citizen interaction has worked in relation to St. Louis air pollution was discussed by Dr. Robert Karsh. Drs. George Berg and David Wilson and Mr. Thomas Fink gave a case study on Rochester water pollution; and Dr. Clarence Gordon on Montana air pollution.

It was reported that a number of new local groups are in progress of formation. On Staten Island such a group would certainly be invaluable to any concerned community group. We have learned from recent air pollution hearings about the high rates of cancer incidence attributed to the north shore. There are changes being planned the effects of which we would like to examine in advance.

For instance, we have learned about the general relationship of wetlands and salt marshes to our food fishes, but what other risks are involved specifically with the City's landfill program as to flooding, water tables, and pollution; what will the meteorological changes which have been observed in connection with new roads already established on the island do to the general temperature of the island, the average rainfall, the incidence of air pollution, even erosion, and of course to the statistics regarding road accidents and respiratory disorders? Can we enumerate all the risks we face in cutting down groves of trees, in leveling terrain, and in placing small houses on small lots in rows backed up with septic tanks in inadequate yards? Also can we find out what will happen to the immediate mainland and to the great harbor of New York if the worst happens and Staten Island assumes the appearance of metropolitan Queens and Brooklyn? Can we draw a relationship between the need to spend one billion dollars for complete sewerage of Staten Island and the health of our beaches and surrounding waters, and possibly sometime the return of shellfish, that could in turn help us decide which is the greater cost? There are many questions we need answered with abundant facts.

The citizen can do no less in his concern for a threatened ecology—which is, after all, his environment, too—than these scientists who feel this warning is important enough to spend their valuable time on gathering facts.

(This conference was supported by a grant from the National Science Foundation, The Division of Public Understanding in Science.)

—G. K. SCHNEIDER

BOOK REVIEW

Sensory Mechanisms by James Case. "Current Concepts in Biology" Series. The Macmillan Company, \$1.95 (paper)

Textbook theory is usually full of cut-and-dried, often uninteresting, axiomatic statements, or so it has frequently seemed to me. When a textbook is instead filled with descriptions of the experiments on which it bases its conclusions, and when it pinpoints areas where knowledge is lacking while speculating on possible solutions, then we can be sure the material is not dull. If too it is the author's purpose to incite further research rather than to shovel a maximum amount of information at the reader, it is definitely worth reading.

The most informative approach to an understanding of receptor mechanisms is gained through realizing the organism's need for various types of information and the specialized elaborations of the basic neuron that have developed to meet these needs. In order to initiate the reader, three major problems are elucidated regarding the properties of the generalized neuron. The translation from the impact of a physical stimulus to the generation of an impulse, the nature of that impulse and the mechanics of impulse transmission are all fundamentals of the sensory process. Diagrams are used to show the chemical reactions at the neuron membrane during rest and action potentials and for the analogy of impulse transmission to the passage of current in an electronic circuit. A description of the experiment which well illustrates the role of the electric current in transmission of the action potential gives the reader an interest in experimental work as well as makes him aware of the important distinction between these two processes. Tracing the impulse back from the postsynaptic membrane of the muscle to the receptor membrane of the sensory neuron, the author points out that the last link, the translation from physical stimulus to increased sodium ion permeability is the least understood aspect of the process. After detailing some experimental evidence on the significance of sodium ion permeability, he offers some possible solutions to this complex problem in order to stimulate the reader's thinking.

A further introduction is offered by giving the reader an idea of the functional use of impulses from the muscle mechanoreceptors. A contrast is made between the needs of vertebrates and crustaceans and the neurological differences that have evolved. It is pointed out that crustaceans have evolved a more useful means of inhibiting accurate muscle control when a vigorous response is required. Continuing in this vein, the author discusses more elaborate mechanoreceptors of these two types of organisms. The statocyst's ability to provide the static and dynamic control information is compared to the ability of the sacculus and utricle of the vertebrate labyrinth while the semicircular canals are viewed as refinements which allow greater specificity of rate of change information. After discussing some of the more complex distinctions, the author informs us that the primary receptor mechanism, the ciliary bundle, has a particular structure common to the entire animal kingdom. Here again the author is challenging the reader to come up with a solution to an as yet unanswered question: What is the significance of this particular structure?

The evolutionary history of the human ear is missing from most neurophysiology texts while comparative anatomy studies tend to overshadow significant generalizations with a mass of detail and terminology. The author avoids this by assigning a common name to each analogous structure in the fish and human auditory apparatus. The lateral line system of the fish is shown to be an intermediate in the evolution of touch receptors into organs for hearing. The use of the ear for auditory localization in fish, man, and bats shows a progression of abilities to the point where bats can get as accurate an impression of their environment as if they had used visual means.

The spectacular abilities of sensory mechanism are emphasized to increase the reader's interest. Where explanations for the mechanism of these abilities are not yet fully certain, the author has cited experimental evidence to support each of the contrasting viewpoints. If this sometimes leaves the reader trying to think up his own experiment to confirm a theory, the author's style can be credited with making him feel justified in doing so. In the discussion of insect chemoreception, detailed descriptions of simple experiments are given. The chapter on vision relates some of the more amazing capacities of the human eye. In addition, there is a wealth of background information which serves to prepare the reader for any reading he will do on this timely subject.

The electrical and chemical reactions which occur when photons strike the rods are elucidated through their relationship to light and dark adapted visual sensitivity. The three components of the

neural impulse produced in the complex human retina are compared to the impulse produced in the horseshoe crab retina, which has a structurally distinct origin for each component. The physiological properties of rhodopsin are given along with some speculation as to how it initiates the neural impulse.

The fact that the eye has its embryonic and evolutionary origin in the brain should indicate that it is capable of impulse analysis within the retina prior to transmission to the brain. This concept of receptor fields which respond only to patterns of light has implications in the understanding of conscious awareness. If we can only see in terms of certain patterns, how accurate can our conception of reality be? On this intriguing point the author leaves and the reader can begin, well prepared to delve into this fascinating field.

—Reviewed by William Bear

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Harry Betros, Curator of the Davis Collections at the Staten Island Museum; teacher of biology and conservation educator.

Joseph F. Burke, *John B. Woodward*, and *Warren E. Flint*, among them have devoted over 90 years to the study of diatoms. All are members of the New York Microscopical Society of which Mr. Burke and Mr. Flint are past-presidents. Their business backgrounds have been finance, architecture, and precision instrumentation respectively.

Hans J. Behm, geologist, now working towards a Ph.D., while employed at Grumman Aircraft Engineering Corporation at Bethpage as an astrogeologist. He was a founder of the American Astronautical Society and is a Fellow of the American Association for the Advancement of Science and an Associate in Sigma Xi.

PROCEEDINGS

Staten Island Institute of Arts and Sciences



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Editor: G. K. Schneider

The Staten Island Improvement Commission of 1870

Part One

Staten Island in the 1870's was a thriving community of 33,000, self-sufficient and proud. Its balanced economic life provided for the wealthy and the not-so-well-to-do. Farming, the most populous vocation of the times, was becoming diversified into truck farming, orchards and nurseries for ornamentals. The shellfish industry was at its height; clams and oysters for the elegant tables of the captains of industry were being taken daily from Raritan and Prince's Bays. Seafaring men left their comfortable homes of the North Shore for the profitable shipping trade. The summer resorts had regained their prominence following a serious setback during the Civil War. Summer residents and visitors came from a wide area, some of whom included presidents' wives and high society from the nation's capital. Large estates had been developed along the ridge of the Island for the wealthy families of the Cunards, the Wards, the Duncans, the Vanderbilts, the Nichols, the Benedicts and the like. These were times of affluence and an expanding economy, but not all was bright on the horizon. Staten Island had its problems too, and a serious negative reputation which was to place the whole island under suspicion was developing.

The Eighteen-seventies saw many long-established factories flourishing while new industries were appearing on the scene. The old Staten Island dyeing establishment of Barrett, Nephews and Company, founded in 1819, was expanding. Its old location at the foot of Broadway had already given the name of "Factoryville" to that area. Its new location at Barrett Avenue and Cherry Lane (now Forest Avenue) was situated at the approximate location of the present site of Sears, Roebuck. By 1874 other dyeworks had sprung up on the Island, including the North Shore Dyeing Company and the New York Dyeing and Print Works. Among other industries active at that time were: Washoe Tool Factory, Elm Park; Jewett's Linseed Oil Works, Port Richmond; Lake's Granite Quarry, Graniteville; Walter and Fielding Paint Manufacturing Company, Meiers Corners; Richmond Iron Mining Company, Meiers Corners; J. Stearns and Company, Silk Manufacturers, New Brighton; Bostwicks American Docks, Tompkinsville; American Linoleum Manufactur-

ing Company, Travis (then known as "Linoleumville"); S. S. White Dental Works, Prince's Bay. It would be another score of years before Prohibition Park (now Westerleigh) would be promoted on Staten Island, so the brewery business in the Eighteen-seventies was a key industry. Rubsam and Horrmann was established in 1870 and other breweries, such as Meyer and Bachmann, Constanz, Bechtels, and Bischoff had been in operation for some time.

The resort trade was reaching its heyday following a setback during and following the Civil War. The Pavilion Hotel, the St. Mark's Hotel, later replaced by Hotel Castleton, The Ocean House on Grant Street, Hotel Wilkenson, and Belmont Hotel in New Brighton were attracting the summer vacationists. Many sporting interests made Staten Island a center for the principal recreations of the day. The first tennis court in America was laid out in 1874 about where the St. George Ferry Terminal now stands. Tennis, which had been brought to this country from France by Miss Mary Outerbridge, was soon to become a lively national sport. At West Brighton Landing stood the famous Neptune Boat Club which vied with a Bayonne boat club for the sculling championship on the Kill Van Kull. At Livingston the Hesper Rowing Association also sent out its sculls for leisurely punting on the Kill. In Tottenville one could belong to the Manahata Club or the Hoboken Yacht Club to go boating on the "Sound," which was the name given in those days to the Arthur Kill. The New York Yacht Club abandoned its first clubhouse in Weehawken, New Jersey, in 1868 and found a new location in Rosebank, facing the Narrows, next to the Austen Family home. The club remained there only until 1871 and during its tenure a four-story pavilion with a large dining hall was built at the end of a pier opposite the clubhouse.

Another favorite sport at that time was the trotting races. The Sea View Park Association had its one-half-mile course on the north side of New Dorp Lane near Richmond Road. William H. Vanderbilt, son of the Commodore, had his own private three-quarters of a mile course at the foot of New Dorp Lane.

Staten Island, then as now, was dependent on first rate transportation facilities. To serve its growing industries, its recreational advantages and its residential potential, ferry service was manifestly important. In the Eighteen-seventies no bridge connected the Island to the mainland, although there was much talk about having one. Ferries operated to Manhattan, Brooklyn, Bayonne, Elizabeth and Perth Amboy. Since ferry service was so important to the Islanders, many complaints arose. There was criticism of the length of time it took a ferry to cross the harbor—and yet today, almost a century later, there's been little improvement in the speed of the crossing.

They complained in those days too, about the filthy conditions of the boats. From letters to the editors at that time, one would have to agree that the conditions were pretty intolerable. We have made strides in the care and maintenance of the ferryboats, but even today passengers still tend to be inconsiderate of public property.

Railroad passenger service began on Staten Island in April of 1860, between Vanderbilt's Landing and Eltingville, and by June of the same year the service was extended all the way to Tottenville. The combination of rail and ferry service in the Eighties and seventies went a long way to open Staten Island as a suburb of the great commercial center of New York City. It continued to hold a significant role in the suburban movement throughout the last half of the nineteenth century.

The population of 33,044 in 1870 was larger by far than other residential suburbs of the time, such as Yonkers (18,320), Paterson (19,588), Flushing (14,673), Elizabeth (11,567), Rye (7,152), and White Plains (3,000). The population increase of Staten Island between 1850 and 1860 was over 10,000 and the Island had more than tripled its population between 1840 and 1870. But the rate of growth began to slow down. Between 1865 and 1870 the rate of growth had diminished to less than 3% a year while towns on Long Island, in Westchester and Northern New Jersey were expanding at the annual rates of 5%, 6% and greater.

What had happened? Staten Island, through no fault of its own, had acquired a "Bad Reputation." First came a totally unsubstantiated rumor of an outbreak of Yellow Fever. This was followed by stories of malaria in certain parts of the Island. Finally unwarranted publicity about unhealthful conditions on the whole island was spread by promoters of other suburbs. For example, the Erie Railroad, wishing to get customers along its line, put out a pamphlet entitled "Suburban Homes for City Businessmen on the Line of the Erie Railway". In it they tell about a young Mr. Smith who worked for a produce house on Water Street in Manhattan. Just married and earning a salary of about \$2,000 a year, the Smiths couldn't afford to live in the city so they began to look to the suburbs. "They went over to Staten Island but one sight of the filthy streets leading to the landing on the East Side was enough, leaving out of sight the uncertainties and infrequencies of the ferry accommodation. Those beautiful hillsides on the North Shore were tempting, but would have to be occupied at too much cost of Smith's comfort and time." Staten Island would have to wake up. Something must be done about these rumors!

Led by the editors of the *Richmond County Gazette*, the leading weekly newspaper of Staten Island at that time, the business

and political leaders came together and decided that something could be done. It is interesting that they recognized that the problem was island-wide. This is quite remarkable in view of the fact that the county of Richmond, although it encompassed the whole of Staten Island, was actually divided into five incorporated towns where the political power rested. To organize the attack island-wide, it was decided to appeal to the State Legislature. With the backing of the authority of the State, the concerned leaders on the Island felt they could find the answers to the problem. The ugly reputation, which was threatening the future development of Staten Island, must be erased.

ESTABLISHMENT OF THE STATEN ISLAND IMPROVEMENT COMMISSION

On June 8th, 1870, a notice appeared in the *Richmond County Gazette* which began as follows: "In pursuance of an Act of the Legislature passed May 5th, 1870, entitled 'An Act to appoint Commissioners to prepare and submit a plan for Roads, Avenues and Parks and other improvements on Staten Island, and for improvement of the means of communication to and from said Island', notice is hereby given by the undersigned Commissioners¹ named in said Act . . . that a meeting of the persons named in said Act will be held at the public house kept by George Sharp in the village of Richmond on the fifth day of July next, at 11 A.M. for the object of organizing said Commission."

In the June 29th edition of the *Gazette* there appeared an editorial, entitled "Westchester-Richmond," in which a comparison of the residential potential of each of the two suburbs was discussed. The editorial concluded with these challenging words, "Let Staten Islanders observe *that no complaint whatever is made against this Island, or ever has been, except what resolved itself into a complaint against the inhabitants thereof.* The testimonials of all as to the natural beauties and advantages of the Island and her felicitous position are constant, unvarying, unanimous." The paper, obviously, was attempting to influence the Commissioners to get them off on the right foot, but it wasn't being very successful, for in the same issue of the *Gazette*, there appeared another notice signed by eight other Commissioners² calling for a meeting of organization to be held July 11 at 4 P.M. at the Adams Hotel in Tompkinsville.

The Commission was off to an inauspicious start. Already conflict, confusion, and controversy reigned. But quickly, as in the

¹N. J. Wyeth, W. S. Hornfager, and Robert Christie, Jr.

²L. H. Meyer, T. Westervelt, W. B. Duncan, C. C. Norvell, S. Marsh, Jr., D. Townsend, D. R. Norvell, and A. C. Bradley.

many differences of opinion yet to come among its eighty-eight members,³ the Commission reached a compromise by holding both meetings, electing Mr. Erastus Brooks its Chairman at the first and then adjourning to the second. At the meeting of July 11th, two secretaries were named, William S. Hornfager and John J. Clute. The provincial interests of the various towns and villages were a problem from the beginning, and recognizing this as a source of continual controversy, a special organizing committee of ten was appointed, two from each of the five incorporated towns: *Castleton*, Nathan M. Heal, B. F. Cook; *Middletown*, Alvin C. Bradley, William Butler Duncan; *Northfield*, Nicholas C. Miller, George Bowman; *Southfield*, Samuel Barton, Jr., Frederick Law Olmsted; *Westfield*, Balthasar Kreischer, Jonathan H. Hedley.

This committee was to set up procedures for a permanent organization and to determine which of the named commissioners were willing to serve and which were not. The second session then adjourned to the July 25th meeting at the same place.

An editorial in the August 10th issue of the *Gazette*, entitled "Co-operation," points again to the prevailing problem of provincialism. After upbraiding some of the individual members for their statements of selfish local interest, the editorial then praises them with these words, ". . . The Commission for Improvements has brought intelligent, enterprising men together from all parts of the island, and one of its most strongly-marked, beneficial features is the tendency already developed to harmonious co-operation."

The next issue of the weekly journal printed the full report of the ten-man committee on Organization with William B. Duncan as chairman. This report and the one prepared for the Commission by the four experts (which will be analyzed in the next chapter) are probably the only two material accomplishments of the Staten Island Improvement Commission. Both show an intelligent depth of understanding of the problems of the day, and both, if fully implemented, would have changed substantially the future of Staten Island. There is little doubt that the Island today would be a different place had the recommendations and warnings of a century ago been heeded. Much of the same inferiority complex which dominated the attitude of many of the members of the Board of Commissioners of 1870 is still plaguing the Island today. Many of the problems then, including improper drainage, irrational street systems, and unsatisfactory water supply, are still with us. In the concluding chapter of this paper I shall try to evaluate what the Island would be like had most of the proposals of these reports of 1870-71 been carried out; what recommendations may still apply;

³See Appendix 1.

and what lessons we should learn from the lack of action exhibited by the Island leaders a hundred years ago.

The report of the Select Committee on Organization, in a flourishing flair of words indicative of those days, began "The Act, which is the fountain of our power and rule of our action, has excited great interest and has been submitted to the greatest scrutiny, and we believe that enlightened public opinion accepts it as containing no powers except as are necessary to the advancement of the public good, placed in the hands of those most interested in preventing their perversion to any other purpose.

"The action of this Board has already been beneficial in arousing a disposition of hopeful inquiry and stimulating cooperation which is the only remedy for evils which are totally beyond the compass of individual power. May it be a beginning of departure from that course of abdication of the rights and duties of citizenship on the part of those most oppressed by public burthens which is at the root of all the grievances of which the public complains. If all will aid in the work of improving our Island, it will be found that the weight of personal sacrifice will be really small upon each individual and the benefits incalculable. If the work of ten is thrown upon one by the non-participation and indifference of many, the process by which public evils are generated and increased will be still continued.

"Let us call your attention to the particular state of things in reference to which the Act creating this Commission was conceived and procured to be enacted." The Report then proceeded to describe in glowing terms the beauties, resources and advantages of Staten Island, followed by a lamenting of the fact that these are not widely recognized. It continued to alternate between the virtues and the iniquities of the Island and concluded that if a general policy of improvements is applied to Staten Island, it would then find its rightful place among the exclusive suburbs of New York City.

One of the final recommendations of the Select Committee on Organization was to seek out and retain the best experts which could be found to prepare an inquiry and survey of the whole Island. On Thursday, September 22, 1870, the Staten Island Improvement Commission met at 9 Nassau Street, with Mr. Erastus Brooks in the chair. The chairman of the Select Committee on Organization, Mr. William B. Duncan, made a report giving the results of an interview with Frederick Law Olmsted, Esq., and the contents of a letter from Mr. Olmsted, the substance of which is as follows: ". . . that he could not travel any distance on Staten Island without noticing signs of inconveniences, extravagance, disappointment and disgust, resulting from the fact that its public works have

been laid out by citizens extremely ignorant and incompetent for the duties they have assumed. . . ." He then goes on to say, "I am profoundly impressed with the evils thus entailed upon us, and which promise to be vastly aggravated in the future, as population increases. Staten Island presents one of the most promising, and at the same time, one of the most difficult fields for professional science of this kind that I know of. The Improvement Commission for this Island has, in my judgment, from the start, to deal with questions which no man is competent to comprehend fully, who has not given years of study to the experience of others and to the science and the arts that apply to them!" Mr. Olmsted then mentioned the names of Messrs. Trowbridge and Richardson and Dr. Harris as gentlemen eminently qualified to perform the services required by the Commission. If men of their competence were secured, he would, with pleasure, take an equal part and compensation with them.

It was reported in the *Gazette* on October 19, 1870, that the Commission had "authorized the employment of Mr. Frederick Law Olmsted, Dr. Elisha Harris and Engineers J. M. Trowbridge and H. H. Richardson, at the expense of \$1200 to make a general reconnaissance of the Island. The purpose of the Commission is to obtain information in regard to the physical, sanitary and other needed improvements with the view of more practical and direct action when such information shall be secured by intelligent experts."

Not much is known today of Dr. Harris or Mr. Trowbridge. We can gather from the Preliminary Report itself that Dr. Harris was a leading expert of his day on the subject of malaria. Although we can find no evidence of J. M. Trowbridge, outside of his connection with the Preliminary Report, we can fairly safely make the assumption that, since he was described as an engineer when he was employed by the Commission, he was a civil engineer with considerable experience in sanitary and drainage problems.

The other two experts, Mr. H. H. Richardson and Mr. Frederick Law Olmsted, on the contrary, are widely known and admired. Today each is recognized as the outstanding contemporary leader of his profession: H. H. Richardson, for his style of architecture and F. L. Olmsted, as the father of landscape architecture in America. It is a remarkable coincidence that young Richardson should have taken up residence with his new bride on Staten Island at approximately the same time that the Olmsteds were returning to live on Staten Island. They both moved to Clifton and their families soon became close personal friends. The year was 1866 and by the time the Staten Island Improvement Commission was authorized in 1870, Richardson had designed and built his own home in Arrochar. Olm-

sted and his partner, Calvert Vaux, were well on their way to completing the supervision of the construction of Prospect Park in Brooklyn. Olmsted had already received national acclaim for his part in the design and development of Central Park and for his work during the Civil War as Executive Secretary of the U. S. Sanitary Commission (later to become the American Red Cross). By 1870 he was a leading citizen of Staten Island and one of the original 88 Commissioners appointed to the Staten Island Improvement Commission.

In Part II of this paper, I will tell the story of Frederick Law Olmsted with particular reference to his two residences on Staten Island and his relationship with the Improvement Commission.

SYNOPSIS OF THE "REPORT OF A PRELIMINARY SCHEME OF IMPROVEMENTS"

On January 12, 1871, the panel of consultants presented to the Commission their "Report of a Preliminary Scheme of Improvements." The Report, an extensive and visionary set of evaluations and recommendations, is too long to reproduce here but it is appropriate to give a synopsis of its contents before a discussion of its significance today is undertaken.

The Report is divided into three chapters, each of which is a report complete within itself. Chapter I is entitled "Questions of General Policy"; Chapter II, "Malaria and Conditions of Health"; Chapter III, "Practical Recommendations."

The first chapter gives a vivid picture of conditions and thinking prevalent on Staten Island in 1870. The introductory paragraph sets the tone of the critical analysis to follow: "We need, first of all, to forecast the future market of this metropolis for real estate, that we can be satisfied what of its demands Staten Island in particular may be prepared to supply with the greatest certainty of large, general and ultimate profit." The report suggested that future market requirements be broadly divided between commercial and domestic needs and that domestic, in this case, should include not only residences but also local household suppliers and services.

In considering the commercial potential, the consultants emphasized the necessity for developing the East Shore between Tompkins' Landing (Victory Boulevard) and the New York Yacht Club (Hylan Boulevard). They disputed at the same time certain ideas prevalent then that other parts of the Island should be made available for commercial and industrial development. Their reasoning was both logical and prophetic. Projecting the future of Staten Island within the context of the entire New York metropolitan area, they proceeded as follows:

1. New York's commercial center lay at the southern part of Manhattan Island below 14th Street. Although business transactions there were continually increasing, the "*number and area of occupation* (of building of the residential class in the New York area outside the commercial center) *is enlarging much more rapidly than that of the commercial class.*"

2. "The necessity of personal conference (between separate offices), gives increasing value to time during certain hours, and distance is for these purposes yet equivalent in the market to time. Hence vicinity to various offices becomes an increasing element of value."

3. This principle applied to industry as well as to commerce. The Report divided manufacturing plants into two types: those which depended on proximity to the commercial center and other industries, and those where the relation between the factory and the market could be distant. It pointed out that Staten Island was not sufficiently close to Wall Street in either time or space; and was not ideally situated as a distribution point for remote factories. The lack of back-up land adjacent to the deep-water shorefront afforded little opportunity for a taxable resource to the county.

4. Manufacturing, although initially beneficial, tended to change the character of the locality and to attract other industries, often less desirable, until the whole district became unfit for residential development.

Based on this reasoning, the consultants' recommendations dismissed any further considerations of a commercial-industrial potential for Staten Island and projected the Island's future in residential terms.

An opposing trend was rising in suburban areas of New York which was employing new street systems, less regular with "larger blocks, wider streets, deeper lots and more open spaces." These new plans were superseding the old rectangular blocks of 25x100 foot lots which were better adapted for purely commercial use. The consultants suggested that practically the whole of Staten Island could be re-planned in this way with "great and speedy profit to its landowners," since "townspeople have been lately tending to break town bounds." But to benefit from this emigration from the city there should be agreement on what class of improvements Staten Island required in order to derive the greatest benefit, and that therefore certain laws should be understood:

Law No. 1—*Cleanliness*, which is not confined to the home's interior but extends to "all that may surround or be associated with them."

Law No. 2—*The separation of domestic from commercial life.*

"... Here then is one reason why our great cities will never be able to retain within narrow limits the families of those who are engaged in their exchanges and manufactures. They will be able to do so less and less, by modifying their plants, making larger blocks, wider streets and more numerous and broader public places and parks, they may bring the necessary evils of compact building within certain bounds, but the process must go much further than it has yet done, . . . before migration to a considerable distance from the commercial districts . . . will cease to grow . . ."

Law No. 3—*Esthetics*. Great natural beauty was then (as now) used as a lure to prospective buyers of suburban land. "It may seem hardly necessary to say that views of woods which will soon be felled, streams which will be turned into sewers, meadows that will be built on, landscapes that may be shut off, are of no permanent value in a home, but it is certain that they are accepted as such in thousands of cases, and that they enter largely into the fictitious valuation of real estate which causes so much distrust and confusion in regard to permanent conditions of value."

Following the statement of these laws the Report examined a number of local experiences which illustrated the "utter folly of a policy which has heretofore been often followed with profit by individual speculators. . . ." All the advantages and potentials of the natural beauty, the location, and the healthfulness of one area of a thousand to fifteen hundred acres located on the East Shore were described from the early days of its settlement up to the time of the writing of the Report. The changes that occurred over the years little by little were interpreted as mistakes of unplanned development and irresponsible land speculation. Between 1845 and 1855 the changes made in the area involved a lower income level of its newer inhabitants. Two or three factories were established; this increased demand for smaller lots for lodging houses, stores, and dramshops. Shops, small houses, and stables occupied the ground least saleable for villas. Fine trees were felled to allow this construction. Roads built across valleys had sometimes arrested the natural flow of water upon the surface. Some old streams not only lost their beauty but, dirtied with household wastes and with water made stagnant by obstructions, became "disgusting and dangerous. Some places presently began to be known as unhealthy. All soon came under suspicion."

The consultants emphasized that the prospective intelligent buyer could no longer inspect an attractive residential site without asking "*. . . What improvements have you here that tend to insure permanent healthfulness and permanent rural beauty?*"

In order to determine the reasons behind the decline in land

values which was taking place on Staten Island at the time of the appointment of the Improvement Commission, and which was probably the consideration which alone had led to the establishment of the Commission, the consultants examined the deterioration of one section of the Island after another. They noted the effect of declining districts on neighboring districts, and followed with an analysis of what would be needed to improve a neighborhood. A discussion on "How far this doubt [raised by the unhealthiness of some districts] applied at this moment to Staten Island as a whole," concluded the catalogue of reasons.

The consultants showed that this bad reputation had spread surprisingly far, citing letters from people living in California and in Europe; yet "there are parts of the Island which now suffer from an undeserved reputation. There are various localities, further from the city, less attractive . . . , and less healthy which stand much higher in the real estate market. There are other places upon the Island, . . . of which . . . the worst has not been told."

The consultants warned that nothing could be done by individual or limited local actions, or by one or two towns, to prevent the reputation from spreading and worsening. They stated their conviction "that some of the local undertakings now in progress, which are expected to relieve real estate from the bad name . . . , are liable to result in further disappointment, not only for the reason that has been given—. . . the impossibility of inducing the general public, from which any considerable improvement of demand must come, to discriminate between good and bad localities upon the Island—but also on account of the superficial character of these works, and the great expense and difficulty which will be found, if any attempt is made, to keep them in efficacious condition."

The transformation of Harlem from a disease-ridden swampy outskirts to a respectable and desirable residential community was cited as a living precedent for what could be done on Staten Island. The example of New Brighton was used to show how real estate values can remain high even on Staten Island itself. "The hope of Staten Island lies in the certain large profits of the substantial improvement of its low-priced lands."

There was a theory prevalent in the 1870's that in any large metropolis the fashionable place to live was only on one side of town. Using London and Paris as examples, the report disparaged this theory as well as the remark often heard in those days that "Staten Island is on the wrong side of town." The consultants noted recent instances in which wealthy families had inspected Staten Island only to settle to the southward in Monmouth County (N.J.). In fact one family moved to a much more inconvenient locality simply on the advice of their doctor that it was healthier.

Using examples in Chicago (probably Riverside) and "Folly Ditch" east of the City of London, England, the experts described the kinds of success which could be achieved if the will were there and the ways and means were forthcoming. Observations on both continents bore out their belief that similar results would follow improvements planned to provide "good roads and walks, and well-drained and healthful building sites with attractive sylvan surroundings within convenient distance of any large town."

The report discusses in some detail the size of individual properties and neighborhood improvements that would be necessary to provide for health, convenience and esthetics. "Houses, for instance, must be so far apart, that the air of each shall be absolutely free from contamination arising from any other or from the highways; the highways must be so far apart, so spacious, so furnished or flanked with trees that organic waste cannot be carried from them, to an injurious extent, into the houses between them; that the air passing across them shall be quickly disinfected or screened of whatever it takes up that is filthy."

In examining in what way life in the suburbs might differ from that in towns, the greatest amenity seemed to be that more time could be, in fact should be, spent out-of-doors which would in turn improve the health and even the "moral condition" of children and adults. In order to take full advantage of this, the consultants urged that ". . . there needs to be attached to every house a series of out-of-doors apartments, not open to public view, in which direct exposure to sun and wind may, when desired, be avoided, and in which various ordinary household occupations may be carried on. One of these should connect with the kitchen, another with the social rooms of the family; there should be turf on which young children can walk, and fall without injury, on which girls can romp without soiling their dresses; there should be a dry walk for damp weather, and a sheltered sitting place for conversation, needlework, reading, teaching and meditation. . . ." It was estimated that this type of planning would not involve a large amount of land, but that it should be at least twice the size of the ordinary town lot of that time, and that its shape would be preferably irregular.

The consultants estimated that lot sizes would range roughly from $\frac{1}{2}$ acre at the least to five acres at the most in order to attract the kind of family which would "prefer to spend more time on the passage, go farther and enjoy the use of more space." It was their opinion that the largest lots should be planned "within an hour of Wall Street on elevated land and in a healthy and well-furnished neighborhood, . . ."

Having given their opinion of what would be demanded for residential development for Staten Island, the experts predicted

that if such building sites were provided as they described with emphasis on healthfulness, spaciousness, good drainage, served with good, cheap, and comfortable transportation from New York, with good tradesmen and public utilities available, and with pleasant and natural scenery, twenty thousand such sites would be sold to as many families at prices a good deal more than double the average value of land on the Island at that time.

In 1870 the key to providing a healthful habitation on Staten Island was to free it from malaria. Chapter II of the Report, "Malaria and Conditions of Health," was originally issued on December 22, 1870, independently of the Report as "A Letter on Certain Sanitary Conditions." Dr. Elisha Harris, an eminent physician who had spent several years studying malaria and certain of the phenomena associated with it, was responsible for this chapter. To present the subject in an intelligent and understandable manner, the consultants organized this section of the report as a series of questions and answers. They were "reviewed and approved, not only by Doctor Harris but by several other medical gentlemen of the Island, and the opinions expressed may, we believe, be regarded with confidence as those to which the closest observation and the most cautious and responsible study of the questions has led. These remarks apply more especially to matters of physiological and medical opinion. For the others, all members of our board may be considered as equally responsible."

What followed was a detailed investigation of malaria: what it was; what were its causes; who was affected by it; what were its sources on Staten Island; and finally, what were the remedies. It is interesting that the actual carrier of malaria, the *Anopheles* mosquito, was completely unknown to the experts of that day. Their answer to the first question was "a poison in the atmosphere of certain localities which is recognized only by its effects of which ague and fever are examples." As to what was known of the causes of malaria two authorities were quoted, one English and one French. Both described malaria as being associated with stagnant water, though they differed in their surmises about how the "ague poison" was produced. It is not surprising that so little was known about malaria in the 1870's when we realize that it was not until 1948 that the full life cycle of the parasite was finally determined and completely understood.¹

¹It was discovered as early as 1854 that quinine was an effective drug in treating malaria, but it was not until 1880 that the French Army physician, Charles Louis Alphonse Laveran, isolated the parasite in the red blood cells of malarial patients. In the 1890's, Sir Roland Ross, a British Army surgeon in India, after much research discovered that the parasites continued their complicated life cycle in the salivary gland of the *Anopheles* mosquito. There

Chapter III of the Report, "Practical Recommendations," began with this brief introduction: "Our undertaking is to suggest to you a series of propositions, which, if you should see fit to adopt them, will serve to determine, approximately, the place, scope and general proportions and relations of the controlling features of a practical plan for the improvement of Staten Island."

They summarized their conviction that the greatest possible prosperity to the Island would be the result only of a greater number of residential sites serviced with urban public conveniences, associated with "permanent and generally available advantages of landscape and sylvan beauty," highly accessible from New York and preeminently healthful.

This chapter of the Report was presented essentially in two parts. The first part generalized on the experts' recommendations to the Improvement Commission, and gave alternatives or choices. (The latter were phrased mostly in the vein of "You do as we recommend or you'll be sorry!") The second part dealt with detailed specifications in the form of fourteen propositions. These were carefully thought out with respect to certain problems peculiar to different parts of the Island, and for the most part, so sound and practical as well as visionary, that many are applicable to the Staten Island of today. A few propositions were subsequently carried out. A few were never instituted and have no validity in today's world. But many, never undertaken, are as pertinent today as they were in 1870. In the final chapter, I will analyze the practical recommendations in the light of current problems of Staten Island today.

The greatest problem facing the Island in 1870 was its bad reputation of unhealthfulness, which, although serious in only certain localities, pervaded the whole Island. The committee of experts cautioned that other improvements such as in transportation or roads would mean nothing unless this problem was eradicated.

The experts placed in relationship "two groups of easily observed sanitary facts" with "two corresponding series of topographical and geological facts." Their first group of "sanitary facts" were "those which exhibit the effects of a subtle and generally weak poison, pervading the air of the larger part of the Island, and the field of which is surely extending" which corresponded with a topographical and geological fact of "a great mass of absorptive non-radiating

remained one gap in the life cycle which defied all investigation. It took several days for the malaria plasmodium to reach the red blood cells after a person had been bitten by the mosquito. Finally, in 1948, two English scientists, Shortt and Garnham, traced the parasite to the human liver, where it remained for from six to twelve days and then entered the red blood cells. Since 1948, great strides have been made, particularly with the help of the United Nations, in the control and eradication of malaria throughout the world.

rock and of strong argillaceous and ferruginous soil in the midst of a natural air tunnel opening from the humid and equally tempered reservoir of the ocean." The second group of sanitary facts "indicate special exemption from certain classes of ailments, and which account for numerous instances of remarkably prolonged vigor and longevity, especially in the older stock of Islanders," was related to the "thin, metallic, non-absorptive and strongly radiating crust which under a condition of prolonged saturation is formed within your superficial soil."

The committee described three circumstances resulting from the saturation of the soil. First: The geological structure of the Island and its special advantages inherent within it have not been known or utilized, because of the changes in topography which resulted from the increase of population, the holding of land for speculation, and the decline of agriculture. Second: The production of air poison was increasing and the general prejudice against those localities where it was liable to occur was growing, tending to involve the whole Island in ruin, unless this tendency could be reversed. Third: "The seed-beds in which malaria is chiefly propagated is so scattered, and the poison so pervasive that there is little or no inducement to improvement by individual or local enterprise."

These circumstances led the experts to present to the Commission two alternatives: One would be to deny their existence. The other would be to "look all the facts fairly in the face, study them deliberately and fully, and then devise and steadily pursue whatever course shall be necessary to a success which shall be really worth something." It was their opinion that the Commission was in existence because the latter course was preferred.

To solve the problem of soil saturation the experts advised the laying of open-jointed pipes, several feet below the surface, so connected and graded that unbroken descending channels for water were formed: this is thorough-drainage.

To solve the problem of acquiring good outlets for private drains, the experts suggested the establishment of a mixed system of public and private drains, later describing in careful detail exactly how a system of thorough-drainage could be developed for specific localities and situations.

The consultants then took up the question of an adequate municipal water supply system for the Island, which was second only to the problem of malaria in their estimation, since in several localities the quality of well water was poor and the quantity obtainable insufficient. They suggested three likely locations in the northern and eastern part of the Island² and two possible locations in the southern part.³ They warned public rights and properties in those

areas should be secured in order to guarantee a supply of good quality water. Later on in the Report there was a more specific and detailed description of each of the suggested water preserves.

The next major area of improvements considered by the panel of consultants was that of "Public Communications" by which they meant roads, railways, ferries, and bridges. It was their opinion that difficulties of access from New York were not among the reasons which influenced future suburban residents against moving to Staten Island. In this respect they stated, "It is not to be denied that the ferry arrangements of Staten Island are singularly bare, rude, unattractive in appearance, and inconvenient compared with what they easily might be; . . ." At this point the experts, however, suggested that external communications were beyond their purview, "except as it is necessary to anticipate improvements in them which would affect the question of the best way to improve the internal communications of the Island."

They did point out that there was a real need for establishing a direct ferry service and landing at the point of the Island nearest to New York. They acknowledged that the need for a ferry landing at New Brighton Point (St. George) had been actively expressed for more than twenty years. They also recognized the state of affairs which continued to deny its realization, which was "that the existing highway system, if the word 'system' is not a misnomer, has been formed without reference to it. New Brighton Point cannot be made accessible, . . . without a widening and straightening and re-grading of some existing highways, the construction of some new ones, and more or less injury to many established property interests."

Having arrived at the problem of providing highway access to New Brighton Point, the consultants took up the larger question of highways for the entire Island. They assumed, following their belief that it was best to plan "a city of detached dwellings for the whole Island," that each of these residences needed direct and comfortable means of transportation (1) to New York City; (2) to local services, schools, and churches; and (3) to other parts of the Island for recreation.

Two other assumptions regarding the future of rapid transit followed: first, "The eventual construction of a railway from some point near New York, either Jersey City or Ellis Island, to a point on the North Shore of Staten Island"; second, "The construction of a railway from the short ferry landing [New Brighton Point] westward, which shall cross the Fresh Kills marshes near their narrowest

²Manordale, Milldale and Martlingdale.

³Lemon Creek and Benham Brook.



- I Westfield Highroad
- II Northfield Highroad
- III Southfield Highroad
- IV Brighton Place
- V Shore Road
- VI Transverse Roads (not shown)
- VII Public Drains (not shown)
- VIII Under Drain and Road Drains (not shown)
- IX Open Public Drains (not shown)
- X Natural Water Courses
- XI Occasional Flood Courses (not shown)
- XII Flood Regulators
- XIII Eastern Water Preserve and Public Common
- XIV Western Water Preserve and Public Common



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point, and thence be carried in a moderately direct course until it makes a junction, not far from Tottenville, with the present railway on the South side; also, that this latter will be extended to New Brighton."

The panel of experts pointed out that "those improvements will be of the most value, which, while directly serving the general convenience, shall incidentally give new and special advantages to property of a more secluded character.

"It is also to be considered that anything that is *beautiful* upon the Island, and which is laid open to public view, is of value to the public, and that no dwelling, however remote from it, can wholly fail to be advanced in value, . . . Public roads . . . incidentally give pleasing prospects to those passing along them. . . ."

Their estimate of what was needed in improved highways, which they felt could be done gradually according to the justification offered by population increase and material wealth of the Island, was developed as a general and comprehensive plan rather than local or detailed. They saw the plan as a frame-work of highways blocking out the entire Island in such a manner that private taste and enterprise would still have free rein; and that its purpose would be to guide improvement and not to hamper it.

They recommended that the plan should be worked out regarding the Island "as so much territory, conformed, populated, situated and affiliated as now, . . . but as entirely without ways of inter-communication"; as they termed it "*de novo*." Once the plan was devised, to proceed to "engraft" it upon the existing conditions, thus using available highways while effecting the transition from the old to the new system with less disturbance.

They rejected contemporary words for roads and chose to use the term "High Road" for their projected major highways. They selected as the focus for these high roads, New Brighton Point. They prophesied a bridge to Elizabeth at the present site of the Goethals Bridge. They described a road system which they called the "Westfield High Road," the "Northfield High Road," and the "Southfield High Road." They accepted a plan proposed by George M. Root, one of the Commissioners, for a shore drive completely around the Island and described a system of transverse roads which would connect with the high roads at intervals of approximately one mile. Finally they showed how the development of residential lots would fit in with the high road plan.

The second part of Chapter III of the Report went into detail on each of the general improvements already described. In Appendix III, there will be found the series of fourteen propositions exactly as they were summarized at the end of the 1870 report. This

part of the chapter need not be elaborated upon here with the exception of propositions XIII and XIV, which explained the projected eastern and western water preserves and public commons.

The Report's recommendations for recreational facilities were unique. Suggested at a time which was prior to the development of the great park systems of America's larger cities, the proposals of the Committee of Experts anticipated these and it is only to be regretted that they were not fully carried out on Staten Island.

Concerning the use of water preserves as parks the consultants observed that the question had been raised whether there would be objection to its use as a public ground for recreation. They referred to the example of Fairmount Park in Philadelphia, Pennsylvania, which was successfully put to such dual use.

As to such development on Staten Island, they projected parks which would include nearly all of the valleys and hillsides which constituted the areas of precipitation for the collection of water. The Eastern waterworks would be served by a park four miles long and at least one mile wide. The Western part of the Island could be served by a water preserve occupying a somewhat central position which would turn to good use a large extent of land of benefit to no one at that time.

A plan for integrating the water preserves with the highway plan was added by the consultants. In this they suggested that the highways "should be laid out on the slopes of the three dales . . . , one on each side of each, in such a manner as to leave the water course generally midway between the two, the intermediate dale-bottom being in the upper parts not more than three or four hundred feet wide, but becoming broader as the points are approached which would be suitable for impounding reservoirs, about and above which there would in each case be a large meadow. This space we should propose to clear of buildings . . . , thin out the trees to open groups and with little or no grading lay it down to grass. . . . We shall speak of it as the Water-Glade.

"The outlines of the Water-Glade would be curving in correspondence with the present forms of the enclosing hills, its bounding roads being carried down the slopes, always upon easy grades, giving occasion for a series of small bays and headlands on its border.

"Outside the bounding road we should recommend that another space, having a depth of fully three hundred feet, should be acquired, which should be cleared of everything likely to occasion contamination, and the surface prepared as might be found most desirable for the collection and discharge of water upon the Water-Glade, by culverts under the highway. This having been done, and

the ground on each side of all branches of the water-course being reserved, the remainder of the exterior ground, which we shall designate the Over-Dale, might be disposed of on long building leases, or possibly sold with certain rights reserved, . . . limiting the number of dwellings providing against cellars, . . . and with cemented outlets to a common pipe which would be provided in the highway, to discharge below the impounding ponds . . . there would perhaps be three hundred acres of the Over-Dale, which . . . might safely be occupied by detached dwellings. . . .

"To the amount of land which should be acquired and held by the public simply from considerations of economy and prudence with regard to water supply and drainage, an addition of a tenth would enable a pleasure-ground to be laid out, which . . . would certainly have a highly interesting and attractive, as well as a wholly original character . . .

"The advantages of such a pleasure-ground in giving increased value to all property on the Island we hardly need argue. . . . Nowhere on Staten Island is there a landscape or even a glimpse of agreeable scenery which belongs permanently to the public—which no man has the right to obstruct and destroy in pursuance of private and selfish ends."

The Report concludes with these words of challenge: "Accepting the estimate which we have taken, and have attempted to justify, of the opportunities and dangers of the island, we believe that we have given you good reasons for adopting each proposition.

"With the problem of ways and means for carrying out the proposition we have nothing to do, nor, as we understand, has your Commission, further than as it affects the question of its practicability; and even on that point the question is not merely what is practicable now, but what is to be practicable? What can be expected of Staten Island? It is for you to determine whether our recommendations assume too much or too little in this respect."

APPENDIX 1:

BOARD OF COMMISSIONERS

STATEN ISLAND IMPROVEMENT COMMISSION OF 1870

President: *ERASTUS BROOKS* 1815-1886 At this time he was an associate editor of *The New York Express* with his brother James. He had previously been elected to the State Senate of New York in 1853; nominated for governor in 1856; member of the 1866-1867 Constitutional Convention and the 1872-1873 Constitutional Commission. He had come to Staten Island in 1863 and lived in West New Brighton on Clove Road, not far from what is now Richmond Terrace, where he farmed for relaxation.

Vice-President and Secretary: *TOMPKINS WESTERVELT* 1830-1882 Son of Dr. John S. Westervelt and grandson of Governor Daniel D. Tompkins; elected county judge and surrogate for six years (1875). Trustee of the Village of New Brighton and counsel to the Staten Island Savings Bank. He lived at the corner of Monroe and Fourth Avenues.

Treasurer: *SAMUEL BARTON, Jr.* Member of the Assembly for Richmond County. He lived on Richmond Road, opposite the Moravian Cemetery.

DR. WILLIAM C. ANDERSON d. 1882 One of the founders of the S. R. Smith Infirmary (now the Staten Island Hospital). Founder of the newspaper *The Sepoy*, in 1859. Lived in Clifton on the west side of Bay (New York Ave.) Street between Clifton and Hylan (or Pennsylvania Avenue).

JOHN A. APPLETON 1817-1881 A member of the famous publishing family, D. Appleton and Company, which he headed in his later years. His residence was at Clifton overlooking the Narrows. His estate was absorbed by the expansion of Fort Wadsworth.

SAMUEL D. BARNES Lived on Shore Road (Richmond Terrace) between Port Richmond, where his family ran the Barnes and Sons' Coal Yard, and Mariners' Harbor.

JAMES G. BENNETT, Jr. A mason who lived on Van Pelt Avenue in Port Richmond and was connected with the Richmond Granite Company which was located where the plaza for the Bayonne Bridge is now situated.

T. B. BLEECKER

JOHN BONNER A resident on Flagg Place (opposite the site of the present Berry Houses) on Todt Hill. He was said to be "notorious in business circles and the press."

GEORGE BOWMAN 1839-? Born in England, he was brought to Staten Island at the age of four. He owned a large amount of property in Mariners' Harbor and may have lived in "Old Place" near the present site of Goethal's Bridge Plaza. Bowman's Brook was probably named for him.

ALVIN C. BRADLEY 1811-1881 Lawyer and supervisor of Middletown in 1872. He lived on the Garret Martling Farm above Four Corners. Bradley Avenue is named for him.

SAMUEL R. BRICK 1809-1885 A bricklayer on Staten Island for ten years he later became an architect and engineer. He was engineer and later president of the Richmond County Gas Light Company for many years. He is recorded also as an inventor. He lived on Richmond Road, probably on what is now the site of the Berry Houses.

ROBERT CHRISTIE, Jr. d. 1873 Prominent lawyer and politician, he was elected State Assemblyman in 1859 and State Senator in 1864. He lived on the southeast corner of Hylan Boulevard and Bay Street (formerly New York and Pennsylvania Avenues).

JOHN J. CISCO d. 1884 A banker who became Sub-Treasurer of the United States in 1864. His offices were at 30 Wall Street; he lived on the old George Law estate on Grymes Hill on Richmond Turnpike (Victory Boulevard) and Eddy Street, approximately the location of the present Silver Lake Apartments. The boundary wall of his estate was said to have been designed by Olmsted.

H. F. CLARK A resident of Clifton.

JOHN J. CLUTE 1807-1879 Publisher and newspaperman; school teacher; and at one time he was county clerk. He published the *North Shore Advocate* from 1869 until 1877. He was author of one of the early histories of Staten Island, "The Annals of Staten Island." He lived in West New Brighton on Water Street near the Shore Road (Richmond Terrace).

THOMAS E. DAVIS, Jr. Son of Thomas E. Davis who was the organizer of the New Brighton Association of 1835, he also had an interest in this development.

DRAKE DE KAY 1827-1886 His full name was Joseph Rodman Drake DeKay but he was familiarly known as "Major" Drake De Kay. He was a speculator and dealer in mining properties and stocks. He lived on the southwest corner of Bard and Forest, and owned property at the corner of Todt Hill Road and Ocean Terrace as well as elsewhere on the Island.

RUFUS KING DELAFIELD 1802-1874 Manufacturer of hydraulic cement; president of the Delafield and Baxter Cement Company. He lived in New Brighton.

J. D. DIX He owned a six-acre estate on Vanderbilt Avenue.

G. D. DUER Lived in New Brighton, possibly at the northwest corner of Henderson and Lafayette Avenues.

WILLIAM BUTLER DUNCAN Member of the firm of Duncan, Sherman and Company. He was a property owner on Grymes Hill until 1896, where he lived on the west side of Howard Avenue, south of Eddy Street. He attempted to develop some of his holdings but was generally unsuccessful.

W. H. GEIB A resident of Richmondtown.

ANDREW H. GREEN Commissioner of Central Park.

J. C. GREEN He lived on the southwest corner of Hamilton and Tompkins (St. Marks Place) Avenues, which is the present site of Curtis High School.

CHARLES K. HAMILTON Hamilton Park and Hamilton Avenue were named for this man and his brother who lived in that area.

Their residences can be found on the 1859 map of Staten Island. Charles Hamilton is notable for his advocacy of a bridge from the Heights above York Avenue to New Jersey as a speedy way of reaching lower Manhattan.

NATHAN M. HEAL President of Barrett, Nephews and Company from 1867 until 1879. He lived on Castleton Avenue between Burgher Avenue and Broadway.

JONATHAN H. HEDLEY An attorney, his office was at 59 Wall Street, New York City. He lived on Annadale Road near Amboy.

JOHN C. HENDERSON An importer with offices at 343 Broadway, New York City. He lived in 1859 on Bard Avenue. Henderson Avenue, which was named after him, passed through his estate.

W. S. HORNFAGER Lived on the west side of Seaside Avenue in Eltingville.

H. N. JARCHON

GEORGE W. JEWETT One of the founders of the Unitarian Church on Staten Island (1851). He was a director of the North Shore Ferry Company. He established the Linseed Oil Factory in 1869. Jewett Avenue was named for the family of which he was a member.

D. W. JUDD

C. KEUTGEN An importer whose office was at 63 Ann Street, New York City. He bought property in Tompkinsville. He was one of the founders of the Lutheran Church on Staten Island.

J. P. KOHLER Lived on Shore Road (now Richmond Terrace) near South Avenue, in Port Richmond.

BALTHASAR KREISCHER 1813-1886 Trained as an architect in Europe, he came to New York City after the Great Fire to help in the rebuilding. He is credited with the discovery of clay deposits on Staten Island. He developed a fire brick business on Staten Island and acquired lands in the area later to be known as Kreischer-ville (now Charleston).

D. C. LEARY Owner of an eighty-acre farm on Arthur Kill Road at Richmondtown.

G. A. LEAVITT Owner of an estate in Clifton at the head of Townsend Avenue.

D. A. LINDSAY

ANSON LIVINGSTON He and his family lived at the Livingston Station in a house, which because of its exposed situation, was called "Bleak House." Evidently of independent means, he kept a boat-house and maintained membership in several yachting clubs.

JAMES McCULLOUGH Lived in Stapleton where he had also owned "McCullough's Shot Tower" at which minié shot used in the Civil War was manufactured.

F. McELROY Lived on Clove Road, north of Castleton Avenue.
JOSE MANZANEDO Lived on Clove Road in West New Brighton. He was a director of the North Shore Ferry Company. His office was at 13 South William Street, New York City.

SAMUEL MARSH, Jr. Lived on Todt Hill.

J. M. MARTIN Owned a large estate of fifty-three acres on Richmond Turnpike (Victory Boulevard) Willowbrook.

Dr. FRANK E. MARTINDALE A member of the Richmond County Medical Society, he lived at Port Richmond.

C. A. MEIGS Lived on Davis Avenue near the Gay house. It is claimed that he was the first to construct a catamaran and use it in Staten Island waters.

LEWIS H. MEYER d. 1892 President of the Staten Island Savings Bank, he lived on Fingerboard Road.

J. M. MILLER

NICHOLAS C. MILLER 1838-? Secretary, later president, of the New York Board of Fire Underwriters. Trustee of: the Mutual Life Insurance Company of New York; the North River Bank of New York City; and the First National Bank of Staten Island. Insurance broker and banker, he lived on Shore Road (Richmond Terrace) and Sharpe Avenue in Port Richmond.

ROBERT B. MINTURN d. 1889 A Greek scholar, he lived on Bard Avenue. President of the American Free Trade League, he was connected with the shipping and commission firm of Grinnell, Minturn and Company.

HENRY C. MORGAN Lived in Travisville.

JOHN P. NESMITH A merchant with offices in New York City. He lived in an estate on Grymes Hill in 1840. Previously he, together with his brother Thomas, began to purchase land on Grymes Hill. John called his home "Inwood," and lived there until 1866. The Serpentine Road ran through his property.

CALEB C. NORVELL Born in Nashville, Tennessee, he became financial editor of *The New York Times*. In 1859 he was one of the managers of the New Brighton Free Reading Room. He lived in New Brighton (now the St. George area).

DUNCAN ROBERTSON NORVELL d. 1909 Son of Caleb, he was a druggist, sea captain, ship broker, member of the Maritime and the Produce Exchanges, and was in charge of the Gratuity Fund of the Produce Exchange. (The Norvell family was connected with the founding and organization of the Natural Science Association of Staten Island, later to become the Staten Island Institute of Arts and Sciences.) He also lived in the locality now known as St. George.

FREDERICK LAW OLMSTED 1822-1903 Came to Staten Island

first about 1848 when he bought Dr. Samuel Akerly's land and house at Great Kills where he lived, possibly until 1859, and which his father, J. J. Olmsted, continued to own for some years afterwards. While on Staten Island he wrote several books, of which "An American Farmer in England" is possibly the best known. Although this home was later known as the "Woods of Arden" house, Olmsted called it "Oakland." He was corresponding secretary of the Agriculture Society of Richmond County in 1851. His connection with the planning and design of Central Park and Prospect Park is well-known. In 1870 he returned to Staten Island and took up residence on Amos Street (now Norwood Street) in Clifton.

S. OWEN A probable resident of Pleasant Plains.

T. PEARSON Lived in New Brighton.

Colonel D. A. PELL Lived at Franklin Avenue and Richmond Terrace.

J. M. PENDLETON This family was among the founders of the Unitarian Church on Staten Island in 1851. Pendleton was connected with the Staten Island Rapid Transit and the North Shore Ferry; post-Commission, he was associated with Erastus Wiman. His home was on Pendleton Place.

AUGUSTUS T. PRENTICE 1826-? Born in New London, Connecticut. He moved to Staten Island in 1858. Admitted to the New York Bar in 1851. He was instrumental in 1865 in obtaining the charter granted in 1866 to the Village of New Brighton. He owned real estate properties in New Brighton, including the Pavilion Hotel. His home was on Tompkins Avenue (St. Marks Place).

W. P. RAYNOR Lived on Richmond Terrace at York Avenue.

BEVERLY ROBINSON A lawyer with offices at 52 Wall Street, New York City. He lived on Henderson Avenue between Lafayette and Clinton Avenue.

R. R. ROOSEVELT and **S. ROOSEVELT** Both lived in what is now St. George. The main connection of the Roosevelt family with Staten Island is through the forebears of President Theodore Roosevelt. The family owned property in New Springville (part of which is now included in the property administered as the Davis Wildlife Refuge), where they spent their summers.

GEORGE M. ROOT 1820-1906 Editor of *The Sepoy* in 1859; justice of the peace in 1860; engineer, surveyor, and mapmaker. His office was at 57 Broadway, New York City. He was secretary of the Staten Island Savings Bank at the time of its organization. In 1888, he published his "Reminiscences" in the *Staten Island Magazine*. He lived on Simonson Avenue in Clifton.

JOHN ROSS

F. R. ROUTH Lived on Henderson Avenue at Lafayette.

Judge P. T. RUGGLES He lived and owned property in what is now called St. George.

R. W. RUSSELL

AUGUST W. SEXTON A manufacturing jeweler with offices in New York City, he lived in 1860 on Castleton Avenue at the end of Burgher Avenue (North Burgher Avenue now goes through property which was formerly his; and his house has since become a Catholic institution). He was instrumental in the founding of the Calvary Presbyterian Church on Staten Island.

FRANCIS GEORGE SHAW 1809-1882 Born in Boston; moved to Staten Island in the late 1840's. A supporter of abolitionism, he was one of the founders of the Republican Party and of the Unitarian Church on Staten Island. Trustee of the Village of New Brighton, the Seamen's Retreat, the S. R. Smith Infirmary, and other institutions. He was instrumental in many Staten Island affairs and has been judged one of the most influential personalities in the history of the Island. Among his children were Josephine Shaw Lowell and Anna Shaw Curtis, wife of George William Curtis.

JOHN W. SIMONTON 1826-1882 Insurance broker; vestryman at St. Andrew's Episcopal Church. Trustee of the Village of New Brighton and the Richmond County Savings Bank. He lived on Lafayette Avenue at Richmond Terrace.

C. BAINBRIDGE SMITH Lawyer and member of the Judiciary Committee, Taxpayers' Vigilance Association, Richmond County.

T. M. SOTHER Lived on the west side of Jewett Avenue, north of Forest Avenue.

HENRY G. STEBBINS President of the Board of Commissioners of Central Park, he lived on his estate in New Brighton.

DWIGHT TOWNSEND Member of Congress, 1863-1865. Descendant of a Long Island family, he was a neighbor of J. A. Appleton's at Fort Wadsworth.

J. TURNER May have lived in Tottenville.

WILLIAM H. VANDERBILT 1821-1885 Son of Commodore Cornelius Vanderbilt, he lived in the "White House" on New Dorp Lane. He conducted a successful commercial career and was reputed to be worth \$200,000,000 at his death. He was vice-president of the Harlem Rail Road. He gave money for the construction of a parsonage and of a house for the caretaker as well as a deed for four acres of land to the Moravian Church at New Dorp.

N. VAN PELT Captain Van Pelt ran a dry goods store at the Port Richmond Steamboat Landing. He also had his residence there.

W. R. WADSWORTH

J. M. WHELPS Lived on Van Pelt Avenue in Port Richmond.

ALBERT OLIVER WILLCOX Lived at first on Willowbrook

Road; later he moved to Richmond Terrace and Lafayette Avenue. Mr. Willcox was absorbed in many causes; he was a firm supporter of abolitionism and women's rights among others. He was president of the Village Improvement Society of New Brighton. In 1874, he lived on Bard Avenue next to the house of George William Curtis.

J. K. HAMILTON WILLCOX Son of Albert Oliver, he inherited his father's interests and concerns in causes. He lived at the same address as that of his father.

ABRAM C. WOOD 1819-1884 Born in New York City; brought to Staten Island in 1821. He lived on Broadway near Castleton Avenue. He was connected with the firm of Barrett, Nephews.

GEORGE WOTHERSPOON He kept weather records for the years 1846-1852 which were published in the PROCEEDINGS for 1907. Born in Scotland, he lived at first on Staten Island in a house on Shore Road (Richmond Terrace), built by the New Brighton Association, later on Tompkins Avenue (St. Marks Place).

CAPTAIN GARRETT P. WRIGHT Owner of a wholesale oyster business located at the foot of Perry Street, New York City. Lived in "Captain's Row" on Richmond Terrace.

NATHANIEL J. WYETH 1830-1916 Came to Staten Island in 1854. A lawyer and a member of the State Legislature, he lived on Meissner Avenue, overlooking Richmond Road. Mr. Wyeth had an important part in the writing of this Report for the Commission.

APPENDIX 2:

SCHEME OF IMPROVEMENTS TO BE HAD IN VIEW IN THE STUDY OF A NEW PLAN FOR STATEN ISLAND

I. *Westfield High-road*.—A highway not less than one hundred feet wide from Tottenville to New Brighton Point, by the most direct course which shall be found consistent with ease of grade and reasonable economy of construction.

II. *Northfield High-road*.—A similar highway from the western part of Northfield to New Brighton Point.

III. *Southfield High-road*.—A similar highway from the western part of Southfield to New Brighton Point.

IV. *Brighton Place*.—At the point of junction of the three high-roads, above specified, an open place on the water side, not less than four hundred feet in length upon the shore and two hundred feet deep.

V. *Shore Road*.—A road not less than one hundred feet wide leading from the south end of New York Avenue, Clifton, southward to the shore; thence, westward, along the shore, or as near it as a

reasonable economy will admit, to New Dorp Plains, then curving to the northward so as to make a convenient junction with the Southfield high-road north or north-east of the Great Kills; thence, westward, keeping the Bay in view, to Tottenville; thence, along the shore, or as near the shore, either upon salt marsh or upland, as shall be found consistent with moderate directness and economy, until a connection is made with the existing shore road on the north side of the Island.

VI. *Transverse Roads*.—Roads not less than fifty feet wide crossing the high-roads wherever the topography admits, at intervals not exceeding, on an average, half a mile, nor nearer together, on an average, than a quarter of a mile.

VII. *Public Drains*.—Public Drains, at intervals not exceeding half a mile, nor nearer together, on an average, than quarter of a mile, throughout the Island, the salt marshes alone excepted, to be adapted to serve as outfalls for the thorough-drainage of all the lands between them, and also to receive the surface drainage of the highways.

VIII. *Under Drain and Road Drains*.—Wherever the public drains will be required to receive no more water than can be safely carried in a pipe of fifteen inches calibre, they may be covered drains, laid as far as practicable within the bounds of public highways.

IX. *Open Public Drains*.—Open drains either to be boxed, or to be cut with side slopes of never less than one foot horizontal to one of vertical measurement, and whenever such side slopes are impracticable, to have smooth floors of firm material, and such wall as may be necessary to prevent caving or crumbling of sides.

X. *Natural Water Courses*.—The beds of all open water courses to be made sufficiently firm, smooth and dishing towards the deepest part of the channel, to prevent any lodgement of the water, as the streams shrink in summer, in ponds where it will be liable to stagnate.

XI. *Occasional Flood Courses*.—Wherever any open drain or water course is liable to great fluctuations of service, as to flood by storm, and stagnation by drought, provision, if practicable, to be made for laying a pipe below such open drain, the use of the open drain being to dispose safely of floods which the pipe cannot carry.

XII. *Flood Regulators*.—On any line of drainage which it may be desirable to follow in laying out a public highway, and the stream of which is liable to great fluctuations, a sufficiently deep and broad valley, or depression of the surface, to serve as a catch water drain, safety pond and flood regulator; the surface of the ground being sodded and otherwise prepared, so as to have an agreeable appearance, and whenever practicable, fitted to serve as a public green,

the road way being carried on each side of the depressed ground.

XIII. *Eastern Water Preserve and Public Common.*—A system of water works for the eastern part of the Island to be had in view, the suggestion being favored of appropriating to this purpose so much as is desirable of the ground designated in the report before the Commission as the Martling-dale, the Manor-dale and the Mill-dale, with reference to the Impounding Reservoirs, and the preservation of the purity of the water to be collected in them. An appropriation to be made of from five to ten acres of ground upon Fox Hill and upon Signal Hill, selected with reference to the double purpose of distributing reservoirs and public recreation grounds, and these sites may be connected by arms from fifty to one hundred and fifty feet wide, with the ground proposed to be appropriated as a water preserve, and the whole designed to serve as a public common.

XIV. *Western Water Preserve and Public Common.*—Suitable grounds for the collection, storage and distribution of the waters of Lemon Creek and Benham Brook, to be selected and laid off, and these to be of the extent required to admit of a system of conservation and management, in all respects similar to that proposed to be had in view for the Eastern Water Works.

Respectfully,

FRED. LAW OLMSTED,
ELISHA HARRIS,
J. M. TROWBRIDGE,
H. H. RICHARDSON.

COMMUNICATIONS

Survey of Archeological Sites on Staten Island

Mrs. Judy Harik has assumed the responsibility of carrying on the work of preparing brief reports and maps of every known site on Staten Island, whether completely excavated or not, for registration with the State Archeologist's Office in Albany. Previously, with the active assistance of Dr. Bert Salwen of the Anthropology Department at New York University, a number of reports had already been registered and identification numbers returned for our records. Mrs. Harik will act under the aegis of this Institute in the capacity of Research Associate in Archeology in coordinating all activity around any Staten Island site, including when necessary the invocation of the Salvage Archeology Act through which the State Department of Roads has agreed to suspend work when an active site is threatened until excavation and recording can be completed.

She will continue to have the professional guidance of Dr. Salwen, and the assistance of Mr. John Cole, Columbia University Senior in the Anthropology Department, who has been assigned internship here through the Urban Corps.

Mrs. Harik is a native Staten Islander who has been known locally more for her horsemanship than for her other excellent qualifications and abilities. She has a bachelor's degree from Drew University in New Jersey and a master's degree from Ohio State University. Her interest in archeology developed after the completion of her academic education while she lived in Philadelphia and worked near the University Museum there and its archeological treasures. She eventually travelled to Saudi Arabia to work and subsequently married Antoine Harik, an archeologist, later moving to Beirut, Lebanon, to live. They are both living now on the Island while Mr. Harik studies for his Ph.D. at Bernard Baruch School. Mrs. Harik, who is currently studying at New York University with Dr. Salwen, hopes eventually to be able to work for her own master's degree in archeology, once her husband's study is finished.

She has involved herself actively in site work, having staked out and dug a site this summer which turned out to be in the path of the West Shore Expressway. She is, as far as we know, the only archeologist working on Staten Island who actually stopped the bulldozers in order that she could finish her dig. She was very pleased with the cooperation given her by the men on the machines.

A recent interview with Dr. Salwen at a Rossville site was published in *The New York Times* (November 5, 1967) in which he pointed out the importance of the New York metropolitan area and underscored the reason for professional concern over the loss of sites. He stated that the City's ". . . key position astride the easiest land and water routes connecting the southeastern coastal plain on the one hand, and New England, inland New York and Canada on the other, made it the repository of archaeological evidence of crucial importance to the understanding of a whole series of culture-history developments affecting a much larger sector of eastern North America." He has proposed to the City various methods of implementing archeological research, among which one suggestion was that of temporary "archeological parks" as has already been suggested for Ward's Point (See Proceedings, Vol. 22: No. 2, p. 54).

Research in Local Pollens

Dr. Joan Kosan, with the cooperation of Mr. Harry Betros, assistant director of High Rock, has embarked upon a program of pollen investigation on Staten Island. The initial work is in the

primary stages of assessment of work to be done, survey of available resources, and making professional contacts. It is expected that eventually a laboratory will be initiated which will begin to make pollen counts, a service which was discontinued two years ago by Purex Laboratories.

Dr. Joan Kosan is a native Staten Islander. She received her bachelor's degree in science from Cornell, her master's in horticulture from the University of Illinois, Urbana, and her doctor's in botany from Columbia University. She has been an instructor in the Biology Department at Wagner College. She lives in West New Brighton with her husband, Stanley Kosan, and their two young children.

This research activity which is sponsored by the Institute will probably be based eventually in High Rock.

Water Quality Examinations

In cooperation with the program of aquatic biology at High Rock as well as with the proposed development of the Davis Refuge marshes for migrant water-fowl, Mr. Gordon Rumore and Mr. Michael Gregory are conducting water quality investigations. The Institute has long been in need of actual information on the viable state of the ponds at High Rock as well on the effect of the pollution known to be characteristic of Arthur Kill on the marshlands of the Refuge.

Mr. Rumore is a bio-chemist and on the staff of the Staten Island Community College. Mr. Gregory is his assistant. Mr. Rumore has for several years applied his interest in water-testing and water-quality as an avocation. His enthusiastic and professional approach to this important work will be a great asset for our program.

The careful and well-timed water analyses being carried out by Mr. Rumore and Mr. Gregory are necessary for the future development, conservation, or repair of environment of these areas.

BOOK REVIEWS

Some thoughts and comments by William Lynn McCracken, Sr., a native of Los Angeles, concerning the recently published book, "Eden in Jeopardy" by Richard G. Lillard of Hollywood and Los Angeles, in which he tells us of the progressive desecration going on out in Los Angeles and in east sections of Southern California.

IN THIS, my brief treatment, I can but touch somewhat lightly on some of the things which are troubling me and so many others and about which the author, Richard Lillard, tells us more thoroughly and far more startlingly in his timely book.

It is very sad to find that many orange groves, large ranches and beautiful homes have given way to super developments imposed by the forces of so-called "Progress." Mr. Lillard, indeed, shows most clearly what wide-spread changes have been going on increasingly since 1915. The author charges this to the blind worship of the automobile and the intricacy of highways and ever-widening freeways which, with the frightening addition of bulldozers and a host of other mechanistic leeches fasten with a strangling hold on a once lovely landscape.

All of this to pave the way for bulging populations. These almost incontrovertible changes have just about ruined any chance for any sort of Renaissance. I so well remember the era of the steam locomotive and the "Whistle Stops" where towns and modest cities grew up. The same conditions prevailed then as far up as San Francisco, including such counties as Santa Clara and San Mateo, and the Bay Cities as well as attractive rural areas. It was a happier time in many ways. I enjoyed seeing the lovely hills and wide views then visible from the train window.

At present, it seems as if the automobile, the smelly bus, and the truck have about robbed us of these delightful scenes and experiences. We miss the vegetable gardens now replaced by huge developments of rows of squattages alternated with rows of all-alike bungled bungalows.

What Mr. Lillard refers to as, "Man's Prodigal Meddling with His Environment" will very likely arouse more attention than most of us may realize. Some of the other titles to his chapters I think it well to mention are, "Mankind on the Move" which portrays the ever-nervous prosperity which never really lets people get settled, whether they be renters or temporary owners of houses. This is so true of the constant crowding of persons into this already choked modern Eden. As a sort of desperate follow-up, the author writes of "The Endless Immigration"; "The Golden Quarter Century" describes an unspoiled era before Henry Ford's mahouts took over (an era, most of which, I happily remember). The San Diego Fair seemed to give promise to real and enduring happiness in living, but this promise disappeared into a period of decline from which there seems no surcease. Yet the Mexican Colonial design used for the Fair's building by Bertram G. Goodhue still seems entirely suitable for Southern California's climate which is somewhat semi-tropical.

In a recent visit we were shocked to see in La Crescenta that real estate developers had sliced off the tops of the hills and even mountains in order to build on terraced plateaus. Even though this slicing was "reinforced" with wire mesh to attempt to hold

the soil or clay in place, erosion problems would be bound to occur, if not sooner, certainly later to endanger all who unknowingly live there.

Much of the present disturbances have to do with man trying to out-do Nature in Southern California and succeeding in stripping Nature.

It is important, I believe, that when we read this book we should remember that Staten Island can and must avoid the mistakes and blunders of my native City of Los Angeles.

Eden in Jeopardy, Richard G. Lillard. Published by A. A. Knopf, Inc. (1967) \$6.95.

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PROCEEDINGS

Staten Island Institute of Arts and Sciences



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Editor: G. K. Schneider

Erratum

Page 18 — 21st line should read
Island Development Coordinator. The League of Women Voters

The Staten Island Improvement Commission of 1870

by BRADFORD M. GREENE

Part Two

(As I indicated in Part I of this article, I will relate in Part 2 the story of Frederick Law Olmsted in more detail with particular reference to his two residencies on Staten Island and his relationship to the Improvement Commission. In the conclusion I will try to analyze the practical recommendations of the 1871 Report in the light of present-day Staten Island.—B.M.G.)

TWICE UPON AN ISLAND

The chairman of the panel of four experts who prepared the 1871 Report of a Preliminary Scheme of Improvements for the Staten Island Improvement Commission was Frederick Law Olmsted. Although he was living on Staten Island when the report was written, he was to move away after 1872. He must have felt some love for the Island, for he twice chose it for his home.

Frederick Law Olmsted was born the elder son of John Olmsted of Hartford, Connecticut, in 1822. His mother died when he was young and his father boarded him out to several ministers during his childhood and youth. He expected to go to Yale College and all of his educational preparation away from home was planned with this in mind. However, he was not formally enrolled at Yale because a severe case of sumac poisoning at the age of fourteen had weakened his eyesight and doctors advised against long hours of study. Instead his father sent him to Andover, Massachusetts, where, from 1838 through 1839, he studied topographical engineering and surveying under the tutorship of the Reverend Mr. Barton. Uncertain of his son's progress at Andover, his father sent him to New York City to clerk in a French dry goods firm. Frederick hated the interminable hours in the shop and longed for his beloved out-of-doors. Although he persevered for two years, he tried to convince his father that he wanted to be a farmer and that he needed further study for this career. His father finally agreed and, in 1842, he was enrolled as a part-time student at Yale College.

The following year, whether from wanderlust or from parental desire, young Frederick signed on as a member of the crew of the bark, *Ronaldson*. Nine long months at sea with short stopovers at strange ports of the Orient served to convince him that his future was in farming. Again his father relented and for several summers he apprenticed on farms in Connecticut and New York. Winters, he would sit in on lectures at Yale. By 1847 Frederick was ready to try farming on his own, and so his father purchased for him a small tract of land in Guilford, Connecticut.

In 1847 the John Olmsteds spent the summer as usual at Sachem's Head, Connecticut. The father saw much of his son that season; they discussed farm crops and animals as well as Frederick's interest in pear trees. Frederick complained that the farm was too small and that he was dissatisfied with the prospect of continuing success.

One day, at the Sachem's Head Hotel, Mr. John Olmsted fell into conversation with Mr. and Mrs. John Bowne of New York City. Mrs. Bowne was the daughter of the late Dr. Akerly* of Staten Island. Dr. Akerly's widow wanted to sell the Akerly farm, "Oakland," a tract of 130 acres in the Woods of Arden section on the south shore of Staten Island. Mr. Bowne invited Mr. Olmsted and his son to inspect the farm, and Frederick, excited with the size and potential value of the property, prevailed upon his father to sell the Guilford land and buy the Akerly farm. Negotiations were completed and Frederick, at the age of twenty-six, moved to the new farm, renamed "Southside," in January, 1848, exactly one year after he had begun farming on his own in Connecticut.

Frederick Law Olmsted worked his farm on Staten Island from 1848 to 1854. In the fall of 1848, young Olmsted wrote to his friend, Frederick Kingsbury:

"I do exceedingly enjoy the view from my house, sometimes it is 'wondrous beautiful'; just now for instance in this charming sleepy autumn haze, I cannot attempt to describe it, constantly changing, always renewedly interesting. I can tell you a few features always present. The water view extends over just half the circle. From the immediate opposite front, to the left of the arc, it is bounded by the horizon,—dark blue ocean, with forever distant sails coming up or sinking as they bid good-bye to America. . . . On the extreme right, across the water [Raritan Bay], the horizon is broken by the hills of Jersey some twelve miles off, I suppose. They sweep off gradually into something like mountains as they curve round facing us; yet to the front, suddenly

* Samuel Akerly, M.D., was, according to Dr. Arthur Hollick (*Proc. Nat. Hist. Soc. S.I.* IX: April 15, 1905), the first resident naturalist on Staten Island. *The Transactions of the New York State Agriculture Society* for 1842 published Dr. Akerly's report on "The Agriculture of Richmond County" which was rich in scientific as well as in economic information about the Island at that time. Dr. Akerly died in 1845.

and abruptly they end in a precipitous cliff similar to their relations, the Palisades of N. River. This is the highland of Navesink, and we can discern a cluster of white towers upon its brink, the fixed and revolving lights and the telegraph station.

"A little beyond it [on the circle's edge] you imagine the horizon is half broken by a yellowish white streak. It is the sand and the spray or foam of Sandy Hook, and the three singularly distinct sails are nothing but three white lighthouses. There is yet another light in sight of us and in a dark night these six lights are curiously interesting, affecting different minds with different ideas or feelings. To me they present a cheerful, neighborhood effect. To a stranger coming here in the dark it seems to me they must have a very sociable look. It is impossible to realize their distance. Staten Island I am sure you would like in itself,—there are many charming inland views."¹

Many years later, after Olmsted's death in 1903, Frederick Kingsbury recalled the development of Southside Farm. Following his description of the house and barn, he noted that:

"... in the rear of the house was a small pond, fifteen or twenty feet in diameter, used for washing wagons, watering stock and as a swimming place for dogs, ducks and geese. There was no turf near it. The whole place was as dirty and disorderly as the bucolic person could desire. It was on the surroundings of the house that Olmsted first showed his genius in landscape construction.

"He moved the barns and all their belongings behind the knoll, he brought the road in so that it approached the house in a graceful curve, he turfed the borders of the pond and planted water plants on its edge and shielded it from all contamination. Thus, with a few strokes and at small expense he transformed the place from a very dirty disagreeable farmyard to a gentleman's house. This was his first attempt of the sort and it was as successful as anything he ever did."²

Olmsted lived on Staten Island until 1854, when he moved to New York City. During his six years on the island he expanded his nursery business, was elected corresponding secretary of the Richmond County Agricultural Society, and traveled through Europe, the Southern States and to Mexico. Several accounts of his travels were published in *The New York Times* for which he was a correspondent. These were later collected into volumes. He ventured into publishing in partnership with George William Curtis, whom he had met when both were contributing editors for *Putnam's Magazine*. They took over the firm of Dix and Edwards, publishers of *Putnam's*, which was in trouble, but unable to save it, they went into debt together which took many years to clear.

On Olmsted's return from a second trip to Europe in 1856, undertaken mainly to straighten out his publishing venture, he decided to try his hand at landscape gardening. He visited a friend

¹ "Frederick Law Olmsted: Landscape Architect. Early Years." Edited by Frederick Law Olmsted, Jr., and Theodora Kimball. G. P. Putnam's Sons: N.Y. 1922. pp. 86-87.

² *Ibid.* pp. 85-86.

of his in Newburgh, New York, Andrew Jackson Downing who was recognized as the leader of the Hudson River School of estate planning. While there Olmsted met Calvert Vaux, a young architect from France. At that time, the newly-formed Central Park Commission needed a superintendent. The park had not yet been laid out but its general location had been settled. Through Downing's recommendation, Olmsted was offered in 1857 the position as superintendent which he gratefully accepted. Later that year the competition for the design of the park was announced. Calvert Vaux invited Olmsted to collaborate with him which Olmsted at first refused to do, feeling it was improper for him to compete since he was employed as superintendent. But when he found out that his superior, General Egbert L. Viele, was entering a design, he agreed to join with Vaux. Together they presented the winning design, entitled the "Greensward" plan.

While supervising the construction of Central Park, Olmsted and his new wife lived at Mount St. Vincent at the northeast corner of the park. Henceforth until the Civil War, he practiced landscape architecture in partnership with Calvert Vaux. While continuing the work on Central Park they undertook several other commissions, including the preparation of a report and plan for the Hartford Retreat for the Insane, and the preliminary plans for Riverside Park in New York City.

When the Civil War broke out, the Reverend Henry Whitney Bellows, leader of the social reform movement in New York City, asked Olmsted to serve as executive secretary to the United States Sanitary Commission, the forerunner of the American Red Cross. Olmsted had done well in reporting impartially and accurately on conditions in the antebellum South. He had also performed excellently in handling several hundred men in the construction of Central Park. These two qualifications presaged the fine work Olmsted was to do in organizing the Sanitary Commission. The long hours he spent finally took their toll; succumbing to overwork and emotional strain, Olmsted was obliged to give up this position in mid-1863.

That summer Olmsted was offered the superintendency of the Mariposa Mining Estates in California. The firm was nearly bankrupt and needed an expert organizer. He accepted the position and sailed, without his family, arriving in San Francisco in October. At about the same time much of his personal effects and his professional library, including a number of rare technical books, were destroyed by fire where they had been stored on his Staten Island farm. Early the next spring, Olmsted was joined by his family and that summer they went camping in Yosemite Valley. September

27, 1864, he was appointed acting chairman of the State Commission for Yosemite Valley and Mariposa Big Tree Grove, the first State Park Reservation in America. While serving on the Commission he prepared a report which, although it was never published in its entirety, paved the way for the preservation of natural scenery in America for public use. He wrote:

"... The enjoyment of the choicest natural scenes in the country and the means of recreation connected with them is thus a monopoly, in a very peculiar manner, of a very few, very rich people. The great mass of society, including those to whom it would be of the greatest benefit, is excluded from it. In the nature of the case private parks can never be used by the mass of the people in any country nor by any considerable number even of the rich, except by the favor of a few, and independence on them.

"Thus without means taken by government to withhold them from the grasp of individuals, all places favorable in scenery to the recreation of the mind and body will be closed against the great body of the people. . . . To simply reserve them from monopoly by individuals, however, it will be obvious, is not all that is necessary. It is necessary that they should be laid open to the use of the body of the people."*

Early in 1865, Olmsted heard from Vaux who had been offered a commission to plan a large park in Brooklyn. Vaux asked Olmsted to collaborate with him. At first Olmsted considered declining because he was so busy with work in California, but, by November, he had accepted the appointment with Vaux to prepare the designs for Prospect Park in Brooklyn, New York.

It was in early 1866 that Olmsted made Staten Island his home for the second time. Instead of his farm, he found a house on Amos Street (now Norwood Street) in Clifton just up from Vanderbilt's Landing. From this point he could easily take the ferry to Brooklyn where, with Vaux, he was supervising the development of Prospect Park. Olmsted and his growing family made this their home until 1872 when they moved to New York City.

In 1866, Olmsted was no longer a young, enterprising farmer but a figure of national acclaim. A man of his stature and vigor would not be content to rest on his laurels, therefore while completing a report on Public Pleasure Grounds for San Francisco, he was beginning park work for New Britain, Connecticut, and Newark, New Jersey. Amherst College honored him with a Master of Arts degree. He started a plan for a proposed suburban community at Riverside near Chicago.

His first concern at this time was the progress in the development of Prospect Park, but other demands were made on his time and the local well-to-do citizens of Staten Island also sought his advice

* *Landscape Architecture, A Quarterly*. Vol. XLIII: No. 1, Section 1. October 1952. p. 21.

for their own private estates. The design of the gates and the wall bordering the present property of Notre Dame Academy (A, page 9) on Staten Island, was attributed to Olmsted who created them for the property which was then a part of the estate of John J. Cisco. Another family of wealth and social position in New York City was that of Henry Mason of Rossville. His thirty-room mansion was surrounded by beautifully planted grounds designed and laid out by Olmsted. Unfortunately nothing but a few exotic pine trees remain on the site of this estate which once overlooked the sailboats on the 'Sound' (Arthur Kill) and the blue hills of New Jersey. In 1870 Charles K. Hamilton approached Olmsted for his advice in regard to a proposed resort, or "exposition," on Staten Island. Mr. Hamilton and his brother later developed Hamilton Park in New Brighton, probably with Olmsted's suggestions.

Many friendships were established between Olmsted and other local residents while the Olmsteds were living on Amos Street from 1866 to 1872. One such friendship, both personal and professional, was with the young architect, Henry Hobson Richardson. Within a year of the time that the Olmsted family came to Clifton, Richardson and his new bride had found a house nearby. A close intimacy grew up between the two families, which was to continue until Richardson's untimely death in 1886 at the age of forty-eight. Richardson was twenty-nine when he came to Staten Island, and had already undertaken one large commission, the Church of the Unity (Unitarian), Springfield, Massachusetts. Even though the majority of his work would continue to be in New England, he chose Staten Island for his home because he felt he would be closer to the hub of architectural activity which then, as now, centered in New York City.

In 1868 Richardson designed and built his own house (B, page 9) in Arrochar, Staten Island. This house still stands at the northeast corner of Lily Pond and McClean Avenues. Although considerably altered, the roof lines and wrought-iron eave rails are as originally designed. Both this house as well as the Olmsted farmhouse (C, page 9) also still standing, should logically become historical and architectural landmarks.

H. H. Richardson worked with Olmsted on many projects. The association of these two men, rich in evidence of mutual respect for one another's work, is a historical example of the way in which the two design professions (architecture and landscape architecture) complement each other. Examples of their joint ventures remain today in the State Hospital, Buffalo (1871-1874), the State Capitol Building, Albany (1876), the Town Hall, North Easton,



C



D



Massachusetts (1879), the bridges over The Fenway, Boston (1880), and the Public Library, Malden, Massachusetts (1884). One significant collaborative effort undertaken by both was their service on the panel of experts hired to write the Report for the Staten Island Improvement Commission.

Another important friendship made by Olmsted during this time was that of William H. Vanderbilt, son of the "Commodore." Much of Olmsted's later work was done for the wealthy Vanderbilts including the Vanderbilt Tomb (D, page 9) in Moravian Cemetery, Staten Island, and the Biltmore, Asheville, North Carolina.

It is not the intention to give the impression that Olmsted devoted all his time and energy to his contacts on Staten Island. However, during his second stay on Staten Island many of the influential as well as talented people who lived on the Island were quick to recognize his genius, and undoubtedly helped his career. His leadership among those selected to prepare the report for the Improvement Commission has left us a priceless document in planning which has weathered almost a century; its implementation remains a legacy of action for us today.

"WHAT CAN BE EXPECTED OF STATEN ISLAND?"

The 1871 Preliminary Scheme of Improvements placed the challenge for action on the Improvement Commission itself. The substance of this concluding chapter is composed of the answers to these questions: what followed immediately upon the issuance of the Report; what was done with the Report and its propositions over the ensuing years; what recommendations might be applicable today.

Newspaper articles and editorials immediately before and after the publication of the 1871 Report expressed the mood in which it was received. An editorial in the *Richmond County Gazette*, in October of 1870, entitled "The Root of the Matter," cautioned:

"The Improvement Commission was admirably calculated to develop the intelligence and enterprise of the Island, and might be reasonably expected to result in a powerful and enlightened cooperative association to remove the general disparagement, so destructive to every interest. However, it has scarcely yet borne such fruits as were expected. Short-sighted egotism and blind, self-injurious selfishness appear yet to hold their own. But we will hope for the best, and that debate and discussion will cease to be simply tedious but ultimately become enlightening and profitable."

The reputation of unhealthfulness has long since left the Island. The threat of an epidemic of malaria has been eliminated from this part of the world. It would be impossible to assess how much the

recommendation for thorough-drainage in the 1871 Report had to do with reducing the problem of malaria on Staten Island. These must have had some influence, since the process of draining stagnant pools and saturated soils would have led to a reduction of the breeding places for mosquitoes. The technique involved was known as "thorough-drainage" in the 1870's and has been described in Part I of this article.

Thorough-drainage was carried out in certain places on the Island, but to what extent it would be difficult to say. What was done was initiated primarily by private landholders and by some developers. Not much notice was undertaken nor demand made by the public until the need for storm sewers in the major streets was recognized many years later.

The importance of proper drainage, both for surface and sub-surface water, is still much neglected on Staten Island. Many unfortunate accidents continue to plague us. Retaining walls collapse and newly placed pavements wash away because they are not properly under-drained during construction. Builders clear land of trees with the result that flash floods and ponding occur on construction sites. In recent years, unsuspecting children playing around job sites have drowned in these unnatural pools of impounded water.

The Report of 1871 emphasized that Staten Island's greatest potential lay in providing "the largest number of sites for dwellings, furnished with urban public conveniences, . . . and generally available advantages of landscape and sylvan beauty. . . ." The same potential remains today: Industrial and commercial interests have come and gone. Effort is continually expended to get more industry and waterfront commerce to come to stay. The East Shore Pier Development, suggested in the 1871 Report as the only commercial development likely to be successful, did, in fact, materialize in 1921, soon after to be known as "Hylan's Folly." Today the hope is for a modern and efficient container port. The lack of sufficient response from industry and commerce to increased efforts should make it clear they will not flock to Staten Island any more readily today than they did a century ago.

Instead individual families seeking their own home *are* flocking to Staten Island. The Island's great potential of the 1870's for a desirable place to live remains the same today. Meanwhile standards have changed. One would presume that the ever-increasing standard-of-living for Americans would have brought about higher standards for the private detached home. Let's make a comparison between the recommendations of the 1871 Report with the standards typical of Staten Island today.

First: the size and shape of the lot. The minimum size of house lot suggested in 1871 was 50' x 150'; today throughout most of Staten Island, the minimum lot is zoned at 40' x 100'. There is a strong groundswell to have this standard raised to 60' x 100', which would be more favorable to proper subdivision development, but still below the 1871 proposal. As to the shape of a lot, the 1871 Report stated:

"It is not desirable that the lot should be a parallelogram or of any regular and uniform shape, on the contrary, it will be more satisfactory if it is not. It is much easier to fit a house and grounds agreeably upon a space of land, the sides of which are not parallel and the angles equal than upon one of the ordinary town-lot form."

Staten Island has been cursed since the 1920's with a gridiron system of street mapping which completely ignores the topography, the water courses, and other natural features worth preserving. This system requires more land for streets than is needed with a corresponding loss of land for private properties. Many streets mapped at 60' in width could be just as efficient at 50', or, in some cases, 40' in width. The space between gridiron streets is almost uniformly 200' allowing only 100' depth for each building lot. If this space were greater there would be less streets to build and more depth of lot. And better still, if the streets followed more closely the contour of the ground, there could be a variety in the shape of house lot, more trees and natural water courses preserved, the grading less at each site, and as a result, a more interesting site plan for each house. In fact, we might even approach the 1871 standard!

Secondly, the preservation of natural features. *"It is the commonest experience that men destroy beauty under an idea that they are going to increase it."* The Report stated this unhappy fact in 1871. How true it is today on Staten Island. Builders and developers pay immensely inflated prices for vacant land because they feel sure that the marvelous views from high ground and handsome stands of trees will attract the home buyer. But, by the time the home buyer moves in, his view is of other houses, just like his own. All the trees have been removed and the high ground leveled to squeeze in as many houses as possible. In recent years, hundreds, perhaps thousands, of acres of Staten Island's natural beauty have been destroyed through poorly planned subdivisions or inappropriate zoning restrictions. There are other alternatives fully as economical if only the builder will take time to investigate them. He will realize that saving some trees, utilizing the natural features and placing his homes for better outlooks will save him money initially through less site preparation, and finally, through a greater return for each house built.

So far, we have dwelt primarily on matters of proper drainage and improved land use. There was a third factor which the 1871 Report stressed as being of equal importance if Staten Island were to achieve "a practically unlimited demand for its real estate . . . a demand which will rapidly multiply the value of every acre of land upon it." The third value was convenience. Once the Island could be freed of malaria, it would be "a comparatively easy matter to make it the healthiest, and at the same time, the most convenient and most beautiful suburb of New York."

By "convenience," the writers of the 1871 Report referred to first-class communications. By "communications," they meant ferry service, rail travel, access to the mainland over bridges, and even bus service on the common highways. Remarkable as it may seem the 1871 Report prophesied the coming of the motor-age with these words, "It is not improbable that steam omnibuses will soon come into use, . . ."

Other improvements to travel were anticipated. The Report proposed that the rapid transit system not only be extended from Stapleton to New Brighton Point (St. George), but thence along the north and west shores to connect up again with the Staten Island Railway (S.I.R.T.), not far from Tottenville. It likewise assumed "as probable the eventual construction of a railway from some point near New York, either Jersey City or Ellis Island, to a point on the north shore of Staten Island." Today almost a hundred years later, strong efforts are at last being made to obtain state and federal funds to accomplish this.

The matter of the ferry service between New York and Staten Island was given much attention in the Report. To quote directly:

" . . . We do not think that the progress of invention is to tell so much in the improvement of the speed with which distance can be overcome as in the cheapness, frequency, regularity and *comfort* of transportation. The question will be between cost of passage and cost of land; the nearer, other things being equal, the more valuable the land and the less of it must be accepted for what each man can afford to pay. But the measure of cost for passage will not be wholly in the value of time required for it and the fare; the incidental occupation of the time will be an important item. At present there is scarcely a suburb of New York the time to reach which from Wall Street, is not, on the average, worse than lost, that is to say, so far from being passed profitably, it is passed most expensively—at great cost of nervous energy, health and comfort. . . . There is no reason to suppose that any form of land communication will ever be invented by which, without vastly larger cost, it will be possible to make time occupied as valuable as it may be now made in water conveyance."

Then pointing to the need for a "bee-line" ferry to New York from

* Although a steam-carriage had been built in France in 1769 and later in England, several omnibuses were put into use until the railway interests legislated them out of existence in 1836; no real movement toward self-propelled motor-cars came until 1891, twenty years after the Staten Island Report.

the point of the Island nearest New York (ferry service from St. George did not begin until 1886), the Report had this word of caution: "There will be a very strong demand that all possible obstacles to absolute regularity and punctuality in running the boats, and especially all possible apologies for abruptly taking off or suspending the usual trips of the boats, shall be overcome and guarded against."

The key to the success of Staten Island development is convenience. Anything that is done to improve the access to the Island will spell growth and increased values. The Verrazano-Narrows Bridge has already proved this. Anything that is done to reduce the convenience of transportation will spell blight and reduced values. Such an example is the abandonment of the North Shore Rapid Transit. The whole North Shore, once the envy of all who lived on the Island, has been suffering from increasing decay and neglect. The potential is there for redevelopment and rehabilitation. Hope for the commercial interests is there if, through cooperative endeavor and increased citizen support, their centers are made attractive and *convenient*. Homes worth rehabilitating both by private and public means are there. Vacant properties in established communities are there which can provide the small home builder a paying investment. But first and foremost, the tracks of the North Shore Rapid Transit are there and they must be put back into service as the initial incentive and even extended north to New York through Bayonne, New Jersey, and south to Tottenville via the West Shore. Thus we take another lesson from the Report of a Preliminary Scheme of Improvements of 1871.

Convenience of access to home sites by way of new highways on Staten Island was one of the major recommendations of the Report. So poorly laid out were the roads in 1871, and so ineffectively did they serve the Island-wide travel, that the Report proposed a completely new network of highways. They projected a system of direct, efficient, and safe roads much as the highway engineers today supplant our major streets and boulevards with expressways, super-highways, and parkways. Several of the suggested routes of the 1871 Report were built. However, not until our present projected super-highways are completed will we have a system of highways similar to that proposed by the Report. Southfield High Road in part, was eventually built as Hylan Boulevard. Westfield High Road in South Richmond became Drumgoole Boulevard. Forest Avenue serves today the route recommended as the Northfield High Road, except that the 1871 route was projected directly through to New Brighton Point (St. George) rather than to its present inefficient terminus at Victory Boulevard. Finally, we may yet see

the recommended Shore Road of 1871, encircling the whole Island when the West Shore Expressway, the Shore Front Drive, and its North Shore Extension become a reality.

There is, I believe, a close relationship between advocacy for public commons a century ago and the desires of many today to preserve the Staten Island Greenbelt with its proposed recreational resource, the "Olmsted Trailway." It was precisely for this reason the trailway was named. As has been pointed out earlier in this paper the chairman of the panel of the four experts selected to prepare the report of 1871 was Frederick Law Olmsted. It was his experience, his ideas, his knowledge of natural resources that caused these words to be written into the 1871 Report:

"Nowhere on Staten Island is there a landscape or even a glimpse of agreeable scenery which belongs permanently to the public—which no man has the right to obstruct and destroy in pursuance of private and selfish ends. . . . We submit that the Island cannot afford to run the risk of losing this opportunity. . . . We propose no constructed interior roads . . . the character aimed at being that of a rural common. . . . Regarded as a park scheme, much of the glade is already very charmingly planted, the western landscape as seen from all parts of the manor dale [Ocean Terrace at Manor Road] has great breadth and beauty, while from the Dongan knoll [Todt Hill] which is the central feature of the system, the views . . . would be really magnificent, comprehending a grand sweep of the horizon in blue water on one side, in blue hills on the other."

The land described in these passages has come to be known in recent years as the Staten Island Greenbelt. We can no more afford to run the risk of losing the opportunity to have the Greenbelt in 1968 than the Island could in 1871. Although some piecemeal efforts have been accomplished over the years there has not been, until recently, a concerted effort to bring the still surviving natural heritage of Staten Island's central core under open space guarantees through the stewardship of public and private controls. About a third of this area is preserved as Latourette Park. Seventy acres, known as High Rock Park, have recently been rescued from developers at the last moment. The Boy Scouts of America have a large camp nearby as does the Federation of Jewish Philanthropies. The City of New York maintains two institutions, Sea View Hospital and the Farm Colony, in the area. Moravian Cemetery and other private and church-owned property make up most of the remaining Greenbelt.

Over the last seventy-five years, several attempts have been made to place a pleasure drive through the Greenbelt area. About thirty years ago, a motor highway, designated the "Richmond Parkway," was planned to transverse almost five miles of the central ridge. The 1871 Report remarked about the advisability of placing a road along this route:

"The Westfield High-Road, as thus proposed, falls it will be observed, to the northward of the main central ridge, or back bone, of the Island. This ridge extends only from the Fresh Kills near Richmond to Stapleton, but while its altitude is melted away in gentle slopes to the northward toward the Sound, [Arthur Kill] permitting in that quarter the greatest freedom in the location of roads, it descends toward the sea on the south, in steep and broken declivities, impractical for roads for rapid travel. As a route toward New York it will therefore be of no direct value to the residents of the greater part of the extensive and populous district of Southfield lying between the crest and the Bay."

The route of the proposed road through the Greenbelt does follow the ridge and is presently mapped as a parkway. It is this, the Richmond Parkway, built as a modern super-highway, that would destroy the integrity of the natural area by cutting a wide swath along the backbone of the Island, splitting the Greenbelt in two. It is the Olmsted Trailway, using the right-of-way of the proposed parkway, that would maintain the integrity of the area by placing nature trails, bikeways, and bridle paths along the ridge.

The Report was presented to the Commission on January 12, 1871. At its next regular meeting on February 2, an elaborate report on transportation and intercommunication, read by Mr. Nathaniel J. Wyeth, was temporarily tabled. It is not clear whether this report was entirely separate from or merely supplementary to the Report of the four experts. It is probable that the latter is the case, since it is generally accepted that Wyeth was the author of a significant segment of the Report to the Improvement Commission. While he served in the State Legislature (1866 to 1867) he started the original movement for a rapid transit connection between Staten Island and New York City. He also made speeches supporting "An act to provide for laying out, constructing and draining of highways, and for draining of pools, swamps, and wet lands and to ascertain such lands as may be needed for obtaining a water supply." These speeches helped pave the way for the enactment in May 1870 of the law creating the Staten Island Improvement Commission. Appointed as one of its 88 commissioners, Wyeth led in the fight to carry out the recommendations of the Preliminary Scheme of Improvements Report. He drew up plans for the establishment of a Central Park on Staten Island, and later in 1871, was instrumental in the founding of the Staten Island Bridge Company, which became known in 1874 as the "New York Bay Bridge and Transportation Company." This company engaged in a number of projects aimed at realizing some of the proposals of the 1871 Report.

As soon as the 1871 Report was made public, the complaints and criticisms flooded forth. At the February 9th meeting of the Commission, Mr. Daniel Low rose to read a protest, signed by

several Islanders, that new roads were not needed, only repairing of the old roads, and that some areas not needing drainage would have to pay for the drainage of other areas. This matter was tabled but lively discussion of other controversial items followed. The *Richmond County Gazette* countered in its next issue with an editorial, "What is Worth Doing at all is Worth Doing Well," in which it reiterated its faith in the Commission. On February 22, excerpts from the Report were published in the *Gazette* along with another strong editorial, headlined, "Resistance and Obstacles to Progress." This battle of words between obstructionist individuals on one hand and the editors of the *Gazette* on the other continued for another six months and finally faded into oblivion. The only immediate tangible result was an Act proposed directly by the Commission to the State Legislature requesting \$35,000 to survey and map the County of Richmond.

It is a sad commentary that so magnificent an effort by the leading citizens of Staten Island, who sought recommendations from the best talent in the country for the development of the Island, should have come to naught. The Report was remarkable in its foresight, good taste, and practicability. If the recommendations had been followed, Staten Island would today be one of the most beautiful, desirable, and convenient places to live in the New York City area.

The dream of a beautiful island presented in the Report was no more out of step with the 1870's than are the imaginative schemes of urban redevelopment of New Haven, or Boston, or Detroit today. The Report of 1871 got the same inadequate attention then that has been given the report of June 1966 on "Staten Island Development—Policies, Programs, and Priorities," prepared by the City Planning Commission.

Has the general public of Staten Island during the past century really cared about what the Island would be like for generations to come? Do Islanders today really treasure the remaining areas of natural beauty? Do we recognize good quality of long term value? If so, do we demand and work for it? Do we realize the potential we still have to make Staten Island an exciting and delightful residential area of New York? If so, do we know how to attain it?

Or do we really have an inferiority complex, as we are often accused? Do we really suffer from a smug complacency as do so many people who live on islands? Are we apathetic, indifferent, "insular" as the dictionary defines it, "narrow, illiberal, circumscribed"? Is Staten Island really the step-child of New York City, the "forgotten borough"? We hear these expressions, but more from

Islanders than from off-Islanders. Is it not about time we faced up to our responsibilities?

In other suburbs of New York City there is a sense of civic concern. Westchester County takes pride in its park system, in its cultural center in White Plains, in its landmarks and its precious open space, both public and private. Suburbs in New Jersey are much more concerned with their own local community than with the problems of the whole metropolitan region. Nassau and Suffolk Counties are working hard using public relations to improve their image and attract people, industrial plants, and partners in education, recreation, and progress. But where are Staten Island's spokesmen?

We have our elected officials, headed by a devoted Borough President, who serve the Island well. We have a Chamber of Commerce which represents and supports the Island in many important ways. There are county-wide service clubs, athletic groups, and cultural organizations. There are local civic associations and religious groupings of many sects and interests. We have four official Community Planning Boards, a Borough Improvement Board and a Staten Island? Why is there such a resistance against the planning of has its own branch and the Association of American University Women, its own chapter. There is an Institute of Arts and Sciences, a Historical Society, and a Zoological Society. There are citizens' groups for planning, for preserving the Greenbelt, for an Arboretum and for preserving historic landmarks. All are working for a better Staten Island, and all are made up of concerned individuals. But where is the coordination for all these efforts?

Staten Island has a history of which to be proud. She has had periods of great national prominence and periods of unfortunate, and sometimes unwarranted, publicity. The reputation of unhealthfulness of the 1870's was one such period. The manner in which Staten Island has expanded following the opening of the Verrazano Bridge may spell the advent of another such period. Publicity about the Island in recent years has been both good and bad, but the reputation for "ticky-tacky" houses on barren gridiron streets is rapidly characterizing the whole Island. Is this to be the hallmark by which Staten Island is known throughout the world? It will, unless more individuals care and stand forth to create for Staten Island an image of an exciting, progressive and creative community.

Why, for example, do the shopping centers of Staten Island lack the beauty of landscape enhancement or the charm of attractive architecture? Why do the zoning ordinances and the building codes for New York City ignore the unique characteristics of the Island? Why is there such a resistance against the planning of

Annadale-Huguenot as a model community, thus denying to Staten Island a place of leadership as an example of true community planning for the nation?

The answers to all of these and other questions lie in the refusal, so far, of a majority of Islanders to recognize our responsibilities and demand to be heard—not as fragmented groups with selfish local interests, but as one loud clear voice representing the whole Island.

Unless we shake ourselves out of our comfortable lethargy, we shall continue to live, as the Island did in 1871, under the specter of an ugly and unnecessarily bad reputation. If we are satisfied with the label of "second class community" we can retreat into our insular complacency, and into our willingness to adopt mediocrity as a way of life. But if Staten Island is to acquire instead a reputation of which we can all be proud, we must recognize the potential greatness of our Island, discover what efforts are necessary to achieve it, and support these efforts with all our energies.

If the Report of 1871 had had the uniform support of all the Islanders of its time, we would have less of a job to do today. Let us not leave to future generations the burdens and problems we rightfully should bear today. Let us give them an island which they will be proud to call their own.

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The Role of An Urban-Located Interpretive Center

(Summary of a talk delivered by Mr. George O. Pratt, Jr., Director of the Institute, at a meeting of the Nature Study Society, AAAS Annual Meeting, December 1967)

The Institute's experiences during the work of the past two and one-half years in developing, managing, and enlarging an educational program at High Rock Park Nature Conservation Center, New Dorp, Staten Island, N. Y., have covered a complete spectrum. High Rock is one of the few metropolitan nature centers, and the first one in New York City, to use a natural area, as opposed to an "improved" or landscaped area. The Institute's administration is concerned with developing curriculum, policy, and planning, parallel with other centers, but is always aware of the special needs of the New York metropolitan region.

The summary of our work in relation to the key word—"role"—falls into four areas theoretically, but, practically, all four areas are integrated each with the other in lesser or greater ways. There can seldom be a complete separation. These areas are in: EDUCATION, OPEN SPACE PROGRAMS, CATALYST, and COMMUNICATION.

During this period, to terminate with the end of June 1968, the program was supported principally with funds from Title III of the ESEA, administered by the Department of Health, Education, and Welfare, with sponsorship through the Board of Education of the City of New York and Department of Parks.

EDUCATION: Initially, the programs first offered, and now expanded, were guided field trips within High Rock for groups and clubs, and, later, for school classes of children from all boroughs. Almost immediately classroom lectures were added as a part of this program.

From conservation and science education for children, advanced programs in field biology and amphibia were added for older children and 'teens; classes for adults and for teachers (carrying in-service credits) in geology, biology, botany, ornithology, and conservation teaching methods. Special programs were developed for

children with disabilities, such as tours for the blind, the physically- and mentally-handicapped.

The need for a reference library on the site developed quickly and was started with gifts from the Institute's parent library, from members as well as from guides, teachers, and friends of High Rock. The base was laid. Budget was set aside from Federal funds and with consultation between the administration at High Rock and the Institute, new books were purchased. This library now has a stock of 600 books ranging in subject matter from the natural sciences to education and basic reference, plus various other teaching materials and aids. The selection of the library at High Rock was made carefully to supplement, and not duplicate, materials available in other libraries on Staten Island.

For the immediate future, contacts are developing between the Institute and the local academic institutions, which will grow into increased use of the site for various scientific programs and investigations, as well as exchange and enlargement of information.

It is hoped that eventually practice teaching will develop at High Rock. At the present time practice teaching is accredited only when performed within the classroom. For the fullest realization of the benefits of the High Rock program, practice teaching should become a regular part of the program on an accredited basis. We are pleased that various educators in the City of New York are also concerned with bringing this to pass.

At present, the center at High Rock is open seven days a week, and scheduling is constant. There is generally a large number of classes and groups awaiting future openings in the schedule. At times this has involved a waiting list of thousands of students.

The success of this program alone has focused national interest on the Center and on the relative importance of its work to urban areas. It undoubtedly was a force in encouraging the City of New York to agree to take over the funding at High Rock when the Federal grant ends, and in renewing interest in the continuation of natural areas in New York City, and the development of programs of education and recreation within open spaces in parks.

OPEN SPACE PROGRAMS: To guarantee increased growth at High Rock the Institute has found it in its best interest to cooperate wherever possible on open space programs, and legislation involving open space. This included cooperation with the ecological survey contracted for by the Park Department; emphasis on continued education of the community for the need to protect open space; definition of open space and examination of legislation regarding

open space in other cities and states. There is at present no real legislation within the City Charter protecting this ideal.

Community education attempts to interest the individual in participating with agencies supporting open space and park legislation and protection. Another facet of this education is to encourage close and objective examination of community planning so that the citizen understands the need for the continuation and implementation of the space allotted to parkland, or to "forever wild" areas, and for their protection. This is doubly important since High Rock, as stated previously, is the first program to be developed in a completely natural area in this city.

CATALYST: The Institute, through its management of High Rock Center, performs continually the function of a catalyst between the community, on the one hand, and the services available to the community which protect that community's environment, on the other. Oftentimes it is not understood, or recognized, that the environment continually is threatened with degradation. The Institute, in its desire to protect this important resource for the development and continued health of the community, makes itself aware of services available through City, State, or Federal agencies, which can assist in stabilizing, or rolling back, possible environmental degeneration. For instance, the availability of soil survey service from Cornell University was previously unknown to many persons here. There has never been a soil survey of the metropolitan counties, yet this is basic knowledge for the developer, engineer, and builder. Such a soil survey is available at comparatively little cash outlay through governmental cooperation.

The Cornell Extension Service, through its conservation education program, can provide expertise as well as inexpensive texts and syllabi for guide and teacher training.

The developing cooperation between the Staten Island Institute and the Scientists' Institute for Public Information has opened up sources of information, testing, and education, which have, in turn, spurred into activity new research programs for Staten Island in water quality and aerobiology.

Another way in which the Institute acts as a catalyst is in its aforementioned relations with the local colleges. Through both High Rock and the Davis Refuge the Institute is able to provide them with areas for field work and investigations which a major metropolitan area can seldom offer.

COMMUNICATIONS: An obvious side-effect of its role as catalyst is the Institute's concern in helping one part of the community

communicate with the other, even one part of the city with another.

Just as we are able to communicate useful information from various organizations and agencies to those community segments which need it, so also do we open new channels of communication with the more densely populated parts of the city. School groups and private individuals come to us from other boroughs not only for the information on natural science and environmental understanding that we provide but also for new experiences in viewing natural life in an urban setting. We have children from Harlem who have never seen an acorn nor roamed through natural woodland. We have adults who discover first hand how man can alter natural life cycles, life cycles they may only have read about but never witnessed for themselves.

In addition, the very mode of our educational efforts encourages more meaningful communication between individuals, based as it is upon small groups, informal atmosphere, outdoor settings, and leisurely pace. After all, it is hard to hurry a field trip, and difficult to accommodate too many people on a woodland trail at any one time.

Finally, it seems in retrospect that the main role can be described as that of EDUCATION, buttressed and protected by concern with OPEN SPACE PROGRAMS, functioning at the same time as CATALYST, and attempting to provide increased COMMUNICATION.

The beginning has taken form well. The continuation and development remain for future reporting.

Bird Counts on Staten Island 1967-1968

by MATHILDE P. WEINGARTNER

The Annual Christmas Bird Counts have been a regular activity of naturalists connected with the Institute since these were first begun over sixty years ago. At various times, nesting and other counts have also been made over the years.

Mr. Charles Meyer, a member of the team working on the ecological survey of Staten Island which is sponsored and funded by the Department of Parks of the City of New York, emphasized the importance of this continued activity among naturalists. His point was that consistent observation of this kind—*especially when properly recorded and maintained*—could be charted and examined statistically. In turn, increases or decreases in activities peculiar to human environmental disturbances would be indicated through the charts and subsequent statistics. For example, areas in which building construction, garbage filling, fires, and such activities traceable to man were occurring, could be identified. The reverse would also be made clear by the change in size and kind of bird population when these activities diminished or ceased altogether.

This kind of careful nature observation was begun over a century ago in this country, but was discredited for several years when the national emphasis was on the physical sciences. The new nationwide concern over a debilitated environment has once again validated an activity in which many people can participate.

ANNUAL CHRISTMAS BIRD COUNT, DECEMBER 23, 1967

Saturday, December 23rd, was a cloudy day on Staten Island. A light dusting of snow covered the ground. The ponds were still open. Obviously the winter so far had been mild because a number of migrant birds that usually spend the winter south had not yet fled, and because no heavy concentration of ducks was seen on the bay, it was deduced that many of these birds were still on ponds and inlets further north.

Our seventeen observers were divided into seven parties to visit bird feeders, and to comb the woodlands, fields, ponds, and beaches to count each visible feathered creature.

The starling roost at the ferry terminal in St. George was already empty when Miss Weingartner visited it before dawn. Why this should be is not known. However she observed about 2,000 individuals preparing to roost there in the evening.

Three Brown Creepers were counted by Howard Fischer in Willowbrook Park. This is an unusual find on Staten Island at this time of the year. Great Kills Park was populated by 37 Snow Buntings, 4 Short-eared Owls, and an all-time high count of 120 Purple Sandpipers, according to records made by Henry Flamm and Nick Wagerick. Four Housefinches were observed at the Benjaminsons' feeder in Great Kills. These birds are a relatively new arrival on this Island, although they were introduced on Long Island some years ago. The most active bird feeder was the one at High Rock Park where most of the Titmice, Robins, and Towhees were seen.

The special finds at the garbage dumps were: Iceland Gull, Glaucous Gull, and a high count of Red-tailed Hawks. At the beach off Huguenot two Common Eider Ducks, an all-time new find, were reported by Robert Clermont and Anna Meyer who also saw a White-crowned Sparrow which is very rare on Staten Island at this time.

The mild weather together with the heavy crop of Bayberries on which they feed probably accounted for the flock of Myrtle Warblers counted by Esther Brewer.

Observers: Doris Barlow, Mary Benjaminson, Esther Brewer, Howard Cleaves, Robert Clermont, Charles Fallon, Howard Fischer, Henry Flamm, Gregory Loan, Thomas Matterfis, Anna Meyer, Charles Pearson, Jeffrey Safford, Edward Stonick, Nick Wagerik, Mathilde Weingartner, and Richard Zain Edleen.

Listing of Birds Seen:

Common Loon 1
Horned Grebe 73
Double-crested
Cormorant 5
Mute Swan 1
Canada Goose 2
Snow Goose 1
Mallard Duck 55
Black Duck 77
Greater Scaup 4,808
Goldeneye 222
Bufflehead 229
Old Squaw 214
White-winged Scoter 99
Common Scoter 6

Common Eider 2
Green-winged Teal 151
Red-breasted
Merganser 3
Red-tailed Hawk 7
Rough-legged Hawk 9
Sparrow Hawk 8
Pheasant 50
Coot 1
Killdeer 5
Common Snipe 9
Purple Sandpiper 120
Sanderling 10
Glaucous Gull 1
Iceland Gull 1

Great Black-backed
 Gull 2,051
 Herring Gull 33,093
 Ring-billed Gull 45
 Bonaparte's Gull 337
 Mourning Dove 64
 Short-eared Owl 4
 Kingfisher 2
 Flicker 15
 Hairy Woodpecker 6
 Downy Woodpecker 31
 Phoebe 1
 Horned Lark 26
 Blue Jay 125
 American Crow 71
 Fish Crow 6
 Black-capped
 Chickadee 46
 Tufted Titmouse 15
 White-breasted
 Nuthatch 34
 Brown Creeper 3
 Catbird 1
 Mockingbird 22
 Robin 37
 Hermit Thrush 2
 Swainson's Thrush 1

Ruby-crowned
 Kinglet 2
 Cedar Waxwing 9
 Starling 2,709
 Myrtle Warbler 72
 English Sparrow 161
 Meadowlark 1
 Redwing 146
 Rusty Blackbird 7
 Purple Grackle 72
 Cowbird 189
 Cardinal 57
 House Finch 4
 Goldfinch 30
 Towhee 6
 Savannah Sparrow 5
 Junco 324
 Tree Sparrow 239
 Field Sparrow 2
 White-Crowned
 Sparrow 1
 White-throated
 Sparrow 117
 Fox Sparrow 58
 Swamp Sparrow 2
 Song Sparrow 154
 Snow Bunting 37

Total of Individuals Counted: 46,612
Total of Species Seen: 76

STATEN ISLAND WATER-BIRD COUNT

On the second Sunday of each January the Conservation Department of the State of New York asks that a count of the water-birds of the state be taken, separate from the Christmas count. This count has always been under the auspices of the Brooklyn Bird Club in the City, and for the ten years that Staten Island birders have taken part, the count has not differed much from the Christmas count. Hence we have not been in the habit of making a special report for the *Proceedings*.

This year, however, the situation was different. The week of January 7 was one of record-breaking cold. All lakes, ponds, and creeks were frozen over, as was the greater part of the Lower Bay. All fresh-water ducks had deserted their usual haunts, and were to be seen only on the bay. Many others had been driven further south. The day of the count itself was one on which only hardy souls would venture out. This possibly contributed to a lower count than expected. A strong northeasterly wind was blowing making it difficult to face into the wind and to keep glasses, binoculars, and

telescope lenses dry. Much time was spent in wiping. The wind caused heavy waves and rough water, so that ducks would disappear from view the greater part of the time. Ducks also dive, therefore a spot would have to be watched for a span of time to be able to identify the birds.

The list was good in spite of this, although not as many individuals were counted as on the Christmas count:

Horned Grebe	3	American Widgeon	5
Snow Goose	1	Canvasback	239
Brant	5	Greater Scaup	3,648
Mallard	80	Goldeneye	584
Black Duck	285	Bufflehead	363
Gadwall	1	Old Squaw	210
Pintail	1	Red-breasted Merganser	4
Green-winged Teal	50		

The observers: Anna Meyer and Howard Cleaves; Henry Flamm and Nick Wagerik; Bob Clermont and Fred Schaeffer, and Mathilde P. Weingartner.

COMMUNICATIONS

(**ECOLOGY**—A study of the relation of organisms to their environment, or . . . environmental biology.—from *McGraw-Hill Encyclopedia of Science and Technology*, Volume 4.)

What is URBAN ECOLOGY?

A beginning discussion needs to include an assessment of the past growth rates of the world as well as the ability in the past to handle populations. This should supply a basis for examining the present and predicted growth rates of the world including current and anticipated problems. The latter examination may lead to a statement of world-wide responsibility for the under-developed and over-populated regions.

There have been recent developments among which are the widening use of the new chemical contraception methods and the increased dissemination of mechanical birth control information. Objections to official or bureaucratic sponsorship of population control have been raised ranging from statements that tactless or thoughtless emphasis has inspired fear of the possibility of elimination of specific genetic groups, to the bishops' complaint against "forced" birth control information imposed upon the poor. Since the "population explosion" is representative of no genetic nor economic group specifically, these objections can be overcome with

improved teaching methods, humane presentation, and careful education.

The City itself and what it is. Urban populations increase in the main through the movement of a majority of the people from the land to the city. This process is never static and is marked by a rate of occurrence, a span of duration, and a point of cessation. The final attainment of this process is complete urbanization.

Historically, man has been building cities for 5,500 years. The problems of the city and the urban areas are modern however. Today the movement of people to the cities proceeds at a rapid rate, one which has increased over the past 150 years.

The progress towards urbanization can be roughly outlined: The first societies were non-urban folk societies of food gatherers. No specialization of labor and no class distinctions were present. The cultural level was pre-literate. The next jump in societies which took place only about 6,000 years ago was to the feudal or pre-industrialized societies which were a product of agrarian communities. Here for the first time, food surpluses begin to occur. Specialization of labor began to develop and a literate elite developed. Jumping again to a time little more than one hundred years ago we see that new sources of power (steam and later electricity), project abilities far beyond man's muscle. By this century, especially in this country and the rest of the western world, mass literacy has been increasing and the class system appears largely fluid.

The modern city is a community of large size and population density. Men seek the city because it is the source of innovation and culture and the ground for the development of scientific thought.

In the last twenty years since the first uses of nuclear power and the development of the transistor, the process of urbanization has speeded up to the point that in some "old city" areas it has already begun to slow down. There will be a slowing in city growth until the population problem settles. Until then, there has begun to be noticeable a gradual emigration from the "old city" to the regional suburbs and exurbs.

It is predicted that by 1990 one-half of the world will live in cities of 100,000 or more. This is not a contradiction to the previous statement because the rate of urbanization differs all over the world and is based on many factors not the least of which is the rate of economic development of the country. Undeveloped countries are increasing their rate of urbanization as the developed countries decrease.

The sheer survival of the human in the metropolitan environment. Basic to the problem is understanding and controlling the environ-

ment. The earth is itself a closed ecological system. The accelerating population curve—which is closer to a straight line extending up—in relation to the earth's resources presents a ratio in which the apparent problems are manifold.

We have seen that thousands of years ago during the earth's first societies each human was responsible for his own food; in fact surpluses of food did not occur until man's societies were organized to produce surpluses.

The differences between feudal and modern thought are great. The feudal man would not tamper with God's work; he lived in his environment as a part of it and in times of famine, he starved; in times of plenty, he ate. Plagues often raged unchecked because modern medicine had not developed and hygiene was unknown. Disease and illness were often considered special tribulation "to try man's faith" or to punish him for his sins. Modern man changed his environment—in fact in some ways too much—but he learned how to use the environment for his needs. Science today looks for ways to live with the environment, to use it for man's needs and comfort, and to preserve it for the future.

Modern science has made it possible for men to live longer and to be healthier than ever before. Many diseases have been conquered and there are many ways in which man can protect himself and spin out his life span to double that of his great-grandfather's. The ratio between fewer deaths and many births is the reason for the population increase. War, famine, plague can bring down this increase. The only other way it can be brought down is through planning, especially on a government level.—*Richard Buegler with G. K. Schneider,*

The fitting of man into his environment becomes an urgent problem as the curve of population increase climbs steeply. Man, during his tenure on earth, repeatedly has had to deal with over-populations, temporary or otherwise, among various living organisms of our planet. With thinly distributed populations, the solution often was migration from the area of the problem. Migration is still possible to under-populated sections of the world, but often to less desirable areas. With the presently increasing population growth, migration opportunities become more and more restricted.

The plague of locusts of biblical history and through the ages to more modern times on our western plains is an example of an over-population problem that man has had to face. There exists no higher organism to deal, by the application of intelligence, with the over-population of man. This does not mean no organism exists that restrains human over-population. Constantly we are battling

viruses, bacteria, and animal parasites which seek to limit undue human proliferation.

Nor does nature alone with its inhibitory organisms present the only danger to mankind. Man is directly responsible for many of the conditions which limit his own survival in his environment. Typical of this is the disposal of waste products. In thinly populated areas the more intelligent of the human population had learned the desirability of separating the water supply on which life depended from waste disposal. But as areas became more populated and congested, it became customary to combine waste disposal with the water supply.

Man learned too that he could combine waste disposal with the fertilization of land. This was a feedback system that worked greatly to his advantage but in turn helped to increase further the population. In the mid-nineteenth century the guano industry flourished mightily but briefly. Guano however was available only in limited quantities and was soon exhausted. The period during which animal wastes were used extended well into the twentieth century and cow manure was spread both on farms and city lawns in a generous fashion until it too became scarce. While not in our own experience, we are told of the intensive gathering of human waste in oriental countries for enrichment of the land to grow necessary food supplies.

The western world has made most liberal use of its system of rivers and lakes to wash out to sea both its human and industrial wastes. For men living in communities, it was a simple and inexpensive method to run sewer lines into existing water supplies. For industry, keenly competitive, a flowing stream provided, without construction or maintenance costs, a pipeline for disposal of the unwanted portions of the raw material, either in unaltered or altered state.

As waste products are used to fertilize the land, the addition of waste products to waterways has also a fertilizing aspect. It produces conditions favorable to the rapid development of organisms so that they over-populate their aqueous habitat. Presumably this could be directed to the growth of a water-crop beneficial to man, but uncontrolled as it is, most often it results in a condition unfavorable to man's pleasure, convenience or even health. To achieve a more satisfactory result, a great deal more of intelligence and effort will have to be applied to the control of waste disposal.

Where wastes have contributed to the growth of organisms making lakes or rivers unsuitable to man's use, as in the instance of blue-green algae to which reference is often made, the feedback of wastes into such waters calls for complete and intelligent control. The

composition of commercial fertilizers for enrichment of land and of vitamin products for human enrichment is controlled by highly technical research and manufacturing processes. It is equally important that the health of our waterways be carefully studied and the matter of feedback and enrichment be given the same scientific consideration that has been applied to the welfare of the land and of man.

No longer is it expedient to return certain elements in excess of the requirements or possible use of the body of water under consideration. If we do so, we profoundly affect the health of the body of water and that of the life within it. If we add elements that cause excess growth of blue-green algae so that it over-populates a pond or lake, we speed up the use of oxygen to an extent that inhibits other forms of life. If after research and experimentation, we come up with a control of feedback that balances the entry of various elements into a body of water, we may encourage the growth of other organisms which may inhibit or limit the growth of the blue-green algae. If we learn what elements other organisms need, perhaps for instance the introduction of silica in soluble form, we may encourage the growth of diatoms, a basic food of fish populations.

When America became populated more and more by the overflow from Europe, the waterways were the means of transportation for men and cargo. So on these waterways were built docks and towns. Industry most frequently located in these towns. Later these towns were connected by railroads. Then highways were built for motor vehicles and latterly the airways freeing us from the waterways as a restrictive force in transportation. Many manufacturing operations can be carried on now along the extensive highway system. It is still convenient though for many heavy industries to retain the accessibility of discharge into the waterways. If this is to continue, it may be that man will be forced to consider in what industries and in what combination of industries it is advisable to allow such discharges. If research makes possible a full understanding of the health and welfare of our water resources, it may result in control of discharges from a combination of industries in a system of industrial parks where the feedback to the water supply in rivers and lakes is formulated as are fertilizers and vitamin products for the health and welfare of the land and of man.—*Joseph F. Burke*

* * *

Those wishing a short synopsis on the blue-green algae mentioned in the above Communication are referred to an article by G. E. Fogg in *The Journal of the Quekett Microscopical Club*,

Vol. 30, pp. 261-267, August 1967. This journal may be consulted in the Library of the Staten Island Institute of Arts and Sciences.

"A New Aulacodiscus . . ."

An article describing "A New Aulacodiscus from Nancowry, Nicobar Islands" and written by John B. Woodward, who is co-author with Joseph F. Burke of the continuing *Review of the Genus Aulacodiscus* published by the Staten Island Institute, will appear in a future issue of *The Journal of the Quekett Microscopical Club*. This diatom, the differences of which were first noted by E. C. P. Bone of Sussex, England, was investigated in cooperation with Mr. Burke and Mr. Woodward. It is noted that the holotype has been deposited with the British Museum (Natural History), London, England, with an assigned number, B.M. 77608. It is further noted in the References that the fossil deposit on Nancowry Island is thought to be of Miocene age. The photomicrographs of the diatom were made by Warren E. Flint.

BOOK REVIEW

The Life of Rivers and Streams Robert L. Usinger ("Our Living World of Nature" series) McGraw-Hill, Inc. (1967) \$4.95

The characteristic of the series "Our Living World of Nature," is its examination in depth of the total environment being described. In this book we follow the stream in all of its different aspects from its appearance as an icy trickle, high upon mountains, through its growth, its confluence with other surface waters, through flooding, drought, and normal water stages, down the rivers to the sea. Its importance to man as a habitat and a resource assumes dimension in Usinger's discussion of the life forms indigenous to its surface films, its streamsides, its rapids and waterfalls, its varying bottoms.

Robert Usinger is Professor of Entomology at the University of California, Berkeley. He has worked at fresh-water biology stations in Europe, Africa, and South America, and has conducted field work for many years in California at the Sagehen Creek Experiment Station which he helped establish for the study of natural reproduction of trout.

His discussion of the term "biological oxygen demand" which, shortened to "BOD," is tossed about in water pollution discussions by the experts, makes the terminology understandable to the layman. He enumerates some of nature's indicators of pollution; the relationship of algae to the oxygen content of water and as a primary food and a basic ingredient in life support of the stream.

In describing the importance of stream productivity to fish population he discusses the contributions to this research made by the ecologist, Odum, and the biologist, Needham. This provides an impetus to study which the alert student will eagerly pick up for additional reading. The inclusion of an excellent basic bibliography at the end of the book assists in this.

Aside from the value of his information, the author's style is most engaging. He not only obviously lives in his work, he is constantly absorbed in the contemplation of these surroundings in which he finds his work. The minutiae he describes are not inconsequential but are to be savored. His writing makes this book one of the easiest of its kind to read. It is a welcoming introduction to an important biological area.

Magnificent photographs complement the text, the majority of which are reproduced in color. An excellent index and a glossary make up the back-matter along with an appendix which offers a variety of excellent materials: A map of the National Park System and its rivers and streams; an illustrated "Guide to Aquatic Insects"; a list of "Vanishing Fishes"; and a brief, but invaluable, essay on "How to Study Fresh-water Life" which offers diagrams and patterns for simple home-made appliances with which to further this study.

Dr. Ruth Patrick of the Academy of Natural Sciences of Philadelphia and Clarence Tarzwell of the National Maritime Water Quality Laboratory assisted the Series' Editorial Board as special consultants.

In my opinion this series so far has made a unique contribution to basic books for ecological studies. Any library with a limited budget would do well to consider selecting this series.

—G. K. Schneider

ABOUT THE CONTRIBUTORS

Bradford M. Greene, landscape architect, is a member of so many groups active in planning, architecture, and development that there is not enough space here in which to list all of them. He holds positions of responsibility in professional organizations as well as on Staten Island and city-wide committees of social or historical concern. As example, he is currently President of the New York Chapter of the American Society of Landscape Architects and he also is a Trustee of this Institute. After his graduation, *Magna cum Laude*, from Massachusetts State College which awarded him a B.S. in Landscape Architecture, he completed his military service during the Second World War and then took up his chosen profession. Mr. Greene has a long list of accomplishments in the master and site plans he has prepared for many educational, religious, and civic developments. He researched and wrote the two-part article concluded in this issue during much of his spare time over the past two years. The photographs, reproduced on page 9, were taken by the author expressly for this article.

George O. Pratt, Jr., has been Director of the Staten Island Institute of Arts and Sciences since January 1962. When the Institute was given the responsibility of administration of High Rock Park Nature Conservation Center in 1965 this directorship was also added

to his duties. Mr. Pratt believes that, although the burden of work has increased immensely as a result, the advantages accruing to the Institute and to Staten Island are very great.

Mathilde P. Weingartner, Curator of Science and lecturer on conservation and natural history, Staten Island Museum. Member of Torrey Botanical Club; American Malacological Union; Honorary Life Member, S.I.I.A.S., etc. Author, "The Staten Island Walk Book."

Richard Buegler, Science Coordinator for New Dorp High School, formerly was a teacher of biology in the high schools on Staten Island. He is a member of the Institute and has been active in The Study Group, of which he has been president in the past. He is also a member of the newly formed Staten Island Committee for Public Information.

Gail K. Schneider has been Editor and Librarian for the Institute since 1961.

Joseph F. Burke, *John B. Woodward*, and *Warren E. Flint*, among them have devoted over 90 years to the study of diatoms. All are members of the New York Microscopical Society of which Mr. Burke and Mr. Flint are past-presidents. Their business backgrounds have been finance, architecture, and precision instrumentation respectively.

PROCEEDINGS

Staten Island Institute of Arts and Sciences



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Fig. 1

THE WORT FARM:

A Report on the 1963/1964 Excavations

*Contribution Number 2 of the Metropolitan
Area Archaeological Survey*

by LORRAINE E. WILLIAMS

The Wort Farm site (Std. 2-3) is located in Rossville, west central Staten Island. The site is situated on a block of land bounded by Barry Street to the North, Winant Avenue to the West, Woodrow Road to the South, and Rossville Avenue (Fig. 2). The property is now city-owned. The area was surveyed by Skinner (1909:10) in the early years of this century, at which time it was the farm of an Isaac Wort. The extent of Skinner's excavations in the area is unknown.

During the summers of 1963 and 1964 excavations were conducted by Jerome Jacobson (n.d.) and Rex Barritt (1964) with students of the Brooklyn Children's Museum summer anthropology course. Numerous finds had been made in the area during the previous decade by members of the Metropolitan Chapter of the New York Archaeological Society.

The excavations reported on here were conducted at Wort Farm during July and August of 1966, under the direction of the author, with a class from the National-Science-Foundation-sponsored Brooklyn Children's Museum summer workshop in Anthropology. Assistants were Albert Anderson and Judith Budrikas, an undergraduate student at Queens College. In the Spring of 1967, work at the site was conducted by Dr. Shirley Gorenstein, with Columbia University students. The results of their excavations are also included in this report.

The area excavated lies in the Southwest corner of the block and is part of a large tract of land which was burned over by the brush fire of 1963. The site is approximately 100 feet above sea level on heights composed of glacial outwash of the terminal Wis-

consin moraine. A now dry stream bed crosses the site area from Northwest to Southeast. The stream was evidently flowing continuously as recently as thirty years ago. While active, it emptied into a marshy depression half way between Winant and Rossville Avenues in the Southern half of the block and continued as Lemon Creek, flowing into Raritan Bay approximately two miles South. The appearance of the site is, as Jacobson (n.d.: 16) aptly expressed it, "dune-like." The surface is covered by charcoal dust. Catbriar and varieties of scrub vegetation provide a brush-tangled cover.

Two areas of the site were excavated in 1966, with sporadic testing in other sections. Only the results of work in Excavation Areas A and B will be covered in this report. These were the only areas which yielded concentrations of material. The Columbia University excavations were largely confined to Area A.

Excavation Area A (Fig. 2) is located to the South of previously productive excavations by Anderson and other members of the local amateur chapter. A total of thirty-five five-foot squares were dug in this area. Excavation Area B is located Northwest of Area A and immediately to the North of the area extensively excavated by Barritt in 1964 (Fig. 1). Only two five-foot squares were dug in Area B.

Excavation Areas A and B will be treated separately in this report. In the author's opinion they are sufficiently distinct to warrant such treatment for purposes of clarity in description and analysis of the material recovered.

EXCAVATION AREA A

Stratigraphy

The top two inches consist of a fine residue of charcoal dust, the result of a brush fire in 1963. Beneath this is a layer of brown sandy soil, ranging in thickness from 7" to 10", containing a heavy concentration of roots. This is presumed to be the plow zone. Plowshare marks were evident in some instances at its point of transition to the next lower layer, which consists of 25" to 35" of unstratified yellow sand. Roots extend approximately 15" down into this layer. Beneath the yellow sand is a 2" to 8" thick layer of red clay, underlaid by yellow and white mottled sandy gravel. No cultural material was recovered from either the red clay or the underlying gravel.

The following technique of excavation was employed. The charcoal dust was removed first. The plow zone was dug as one unit, absolute depths of artifacts being noted whenever possible. With-

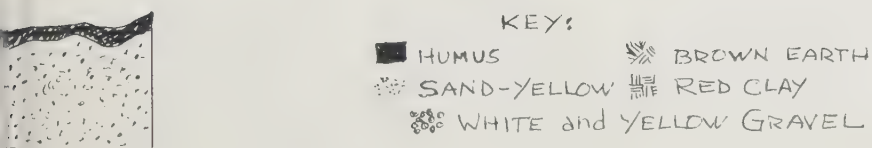


Fig. 2

in the yellow sand layer, in the absence of natural stratigraphy, three-inch artificial levels were employed in an effort to identify components within this layer. On the basis of the distribution of artifacts among the artificial levels (Fig. 3), separate components can be tentatively defined within the sequence in Area A.

Collection

Chipped stone artifacts account for the overwhelming majority of the specimens recovered. Forty-eight percent of the chipped stone artifacts are projectile points.

Two Madison points (Ritchie 1961: 33), one of red chert (Plate 1: a), the other of gray chert, were recovered. The former is $1\frac{1}{2}$ " long, the latter, $1\frac{1}{4}$ " long. Both points measure $\frac{1}{8}$ " in width at the base. The two points are isosceles triangles in shape, with very flat cross sections. The bases are slightly concave. Edges are straight and show fine bifacial retouching.

Two complete projectile points and one base which could be classified as Levanna points (Ritchie 1961: 31) were found. All are of gray chert. The two complete specimens (Plate 1: b, c) measure $1\frac{1}{4}$ " and 1" in length, and 1" and $\frac{3}{4}$ " in width at the base. The basal fragment measures $\frac{3}{8}$ " in width. All are very flat ovals in cross section. The larger point has straight edges, while the edges of the smaller are slightly excurvate. In all three cases, the base is concave, the concavity being off center, producing a slightly lopsided appearance at the base of the points. The shape of the two complete points is an isosceles triangle.

A single Steubenville Stemmed projectile point (Ritchie 1961: 51-52) was recovered. Made of basalt, $1\frac{3}{4}$ " long, it measures $\frac{3}{4}$ " wide at the weakly defined shoulders, the point of maximum width. Blade edges are slightly excurvate. The cross section is an oval, $\frac{1}{4}$ " thick. The base is concave and unifacially thinned.

Six complete projectile points and three bases could be classified as Bare Island points (Kinsey 1959: 115; Kinsey 1961a: 14-15) (Plate 1: f). All are straight stemmed, with well-defined shoulders. Blade edges are slightly excurvate. The points range from $1\frac{1}{8}$ " to $2\frac{1}{4}$ " long, average length being around 2". The maximum width, which always occurs at the shoulders, is between $\frac{3}{8}$ " and $\frac{3}{4}$ ". The cross section is a thick oval. Several specimens display a sinuous edge, as well as spalling along one edge, which may indicate their use as knives. All are of gray argillite. Two of the three broken points may have been used as stemmed scrapers.

Two points, both of gray argillite, have been considered to constitute a variant of the Bare Island points described above on the basis of size. They are slightly broader bladed and larger than the Bare Island points previously described from this site. They measure $2\frac{3}{8}$ " and $2\frac{1}{2}$ " in length, and 1" at the shoulders, the point of maximum width. Both are straight stemmed, with one shoulder more crisply defined than the other. Bases have been unifacially thinned. The cross section is a flat oval. Blade edges are straight to slightly excurvate. These points fit within the range of the Bare Island type as described by Kinsey (1959: 115; 1961a: 14-15).

One stemmed point (Plate 1: g), with a narrow triangular blade and a tapering stem, could be classified as a Poplar Island point (Kinsey: 1959: 115; Kinsey 1961b: 44). It measures $2\frac{1}{2}$ " in length, the maximum width occurring at the shoulders being $\frac{1}{2}$ ". The cross section is a thin oval. The shoulders are rounded, as is the sharply contracted stem. The point is of very weathered gray argillite.

Three complete points, as well as one reworked example, possess attributes

of both Bare Island and Poplar Island points (Plate 1: e). All are of gray argillite. The complete specimens range from 2" to 2½" in length. The average length is just over 2". The maximum width, always occurring at the shoulders, is ¾". All are oval in cross section, with straight to slightly excurvate edges. Two specimens show a sinuous edge with slight spalling, indicating that they may have been used as stemmed knives. The tip of one specimen has been reworked either for or through use as a scraper. All of these points have well-defined shoulders, characteristic of Bare Island points, along with contracting stems, which are more typical of Poplar Island points. In all cases, the stem shows pronounced thinning.

A small stemmed point of black flint measures 1½" long and ¾" wide, at the shoulder, the point of maximum width. It is triangular in cross section. The blade edges are slightly excurvate and display fine bifacial pressure flaking. The shoulders are well-defined. The expanding stem has a slightly concave base, which has been ground. The point resembles those classified as Orient Fishtail (Ritchie 1961: 39), except for the fact that it possesses crisply defined shoulders, which are not characteristic of Orient points.

A small stemmed point of red argillite could not be classified. 1½" long, it is 1⅙" wide at the shoulder, the point of maximum width. The triangular blade has very slightly excurvate edges and is very flat in cross section. The shoulders are asymmetrical, one being crisply defined, the other sloping. The base is extremely thick. A flaw in the raw material may be responsible for its unfinished state.

A small stemmed artifact of red argillite (Plate 1: h), with an unfinished base, is considered to be either an unfinished projectile point or a knife. The thick cross section and sinuous edges suggest that this artifact may be a stemmed knife. However, in the absence of knife-use characteristics, it might be considered to be an unfinished projectile point. It measures 1½" in length (part of the tip is missing), and ¾" at the shoulder, the point of maximum width.

A small very thick stemmed knife of tan chert (Plate 1: d), is 1½" long and ¾" wide at mid-length along the blade, the point of maximum width. The triangular blade has excurvate edges. The shoulders are rounded. The base is thick and unfinished, retaining part of the cortex. One edge is extremely sinuous and has the unifacial spall scars, which are characteristic use marks of a knife. On the basis of these factors, the specimen is considered to be a stemmed knife. It is included in this description of projectile points because of its superficial resemblance to some Lamoka points.

Thirty-one percent of the chipped stone artifacts recovered could be definitely identified as knives.

A total of five stemmed knives were found. One is a partially stemmed backed knife of gray argillite, 2½" long, with a triangular cross section. A small stemmed artifact of purple argillite, with an asymmetrical blade, has one sinuous edge, which shows the spalling characteristic of its use as a knife. The shoulders are well defined, while the stem is sharply contracting. The tip is off center. The specimen measures 1¾" in length, and ¾" in width at the shoulders, the point of maximum width. The cross section is a relatively thick oval.

A stemmed knife of gray-green flint measures 1¾" long and ¾" wide at the shoulders, the point of maximum width. The broad triangular blade is flat in cross section. The blade edges are slightly excurvate. The shoulders are rounded, the stem wide. The basal portion of the stem is broken. The edges show pronounced spalling, indicating use as a knife. In view of the extreme flatness of the cross section, in addition to the fact that the on-center tip is sharply pointed, this artifact may be a projectile point, used as a knife. If so, it is nonetheless unclassifiable as a projectile point, since the base is not complete.

The tan chert knife recovered has already been described under projectile points, although, as mentioned, it has been used as a knife. A slightly stemmed

knife of gray argillite (Plate 1: j) is extremely thick in cross section, while one edge is sinuous and shows spalling, characteristic of its use as a knife.

Four unstemmed triangular knives of gray argillite are biconvex in cross section and possess one sinuous working edge. Two examples are backed. Similar to these artifacts in shape, a flint specimen (Plate 1: k) has been differentiated on the basis of raw material and method of manufacture. It was made on a chert pebble, removing the cortex to achieve the final shape. The cortex is still present on the base and tip.

Two knives of gray argillite are trapezoidal in shape. Only the working edge—on the longer side in each case—shows retouch. A semi-circular shaped knife of red argillite has a convex, sinuous working edge. Notches on the flat edge indicate that the tool is complete in its present condition. A single chert knife made on a pebble, by unifacially flaking one end to a sinuous edge, was recovered.

A single lanceolate knife (Plate 1: i) was recovered. Bifacially flaked to a sinuous edge, it was made of a quartzite and limestone conglomerate.

Five varieties of scrapers were found, most represented by a single example. One is a nosed scraper (or graver) made on a chert pebble by bifacially flaking one end to produce a working edge with an angle of approximately 45° . A concavo-convex sidescraper of gray basalt was found in two pieces in contiguous squares within the same 3" artificial level. It shows unifacial flaking producing a working edge of approximately 40° .

A fragment of a circular scraper made of red, green, and yellow veined chert, shows dorsal polish and use marks on the steeply retouched working edge (angle of about 75°). Two chert scrapers showing rather amorphous scraping retouch and an oval-shaped chert waste flake showing scraping retouch on the broader end were also recovered.

Three varieties of drills were recovered. They are all of gray argillite and triangular in outline. Two are broad and flat in section. One is broad but thicker in section, while the fourth is narrow and very thick in section.

A single crude sandstone chopper, unifacially flaked to form one sinuous edge, was recovered.

Tip and mid-section fragments of projectile points and fragments of chipped stone showing a knife-like working edge but too small to be classified were not included in the above typology. Numerous chert and argillite chips were recovered, along with small numbers of quartz, quartzite, basalt, and sandstone chips.

Ground stone

Only one artifact which shows signs of purposeful grinding and polishing was found. This is an axe bit.

Abraded stone

This category is distinguished from ground stone on the basis of grinding, pecking, or polishing as a step in the manufacture of the artifact as opposed to grinding, pecking, or polishing which is acquired as the result of the use to which the artifact is put. The latter condition applies to this category, which includes one grinding stone—a flattened pebble with the cortex broken on both ends, while the broad surfaces show pitting and lack of patina—and two hammerstones, both of which show signs of heavy battering on one end. Other pebbles and pebble fragments may have been used but could not be definitely identified.

Pottery

A total of 14 sherds of pottery were recovered from Excavation Area A. Two were too small and eroded to permit classification. The remainder were classified on the basis of paste characteristics, surface treatment, temper, and rim treatment. All are coil made.

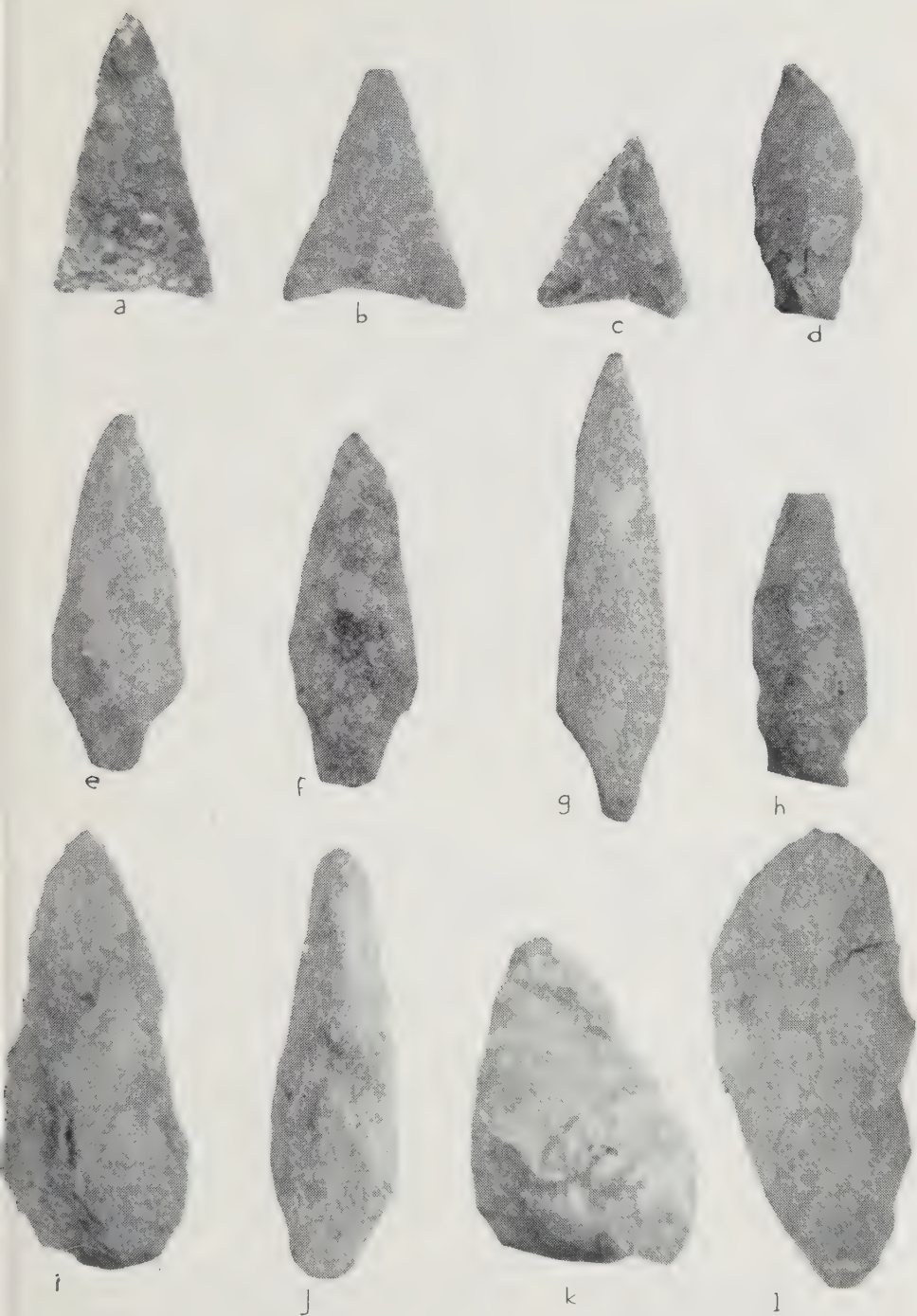


Plate 1

Five sherds, including one rim sherd (Plate 2: d) of North Beach Net Marked Ware (Smith 1950: 196), were recovered. The paste is tan in color, coarse, grit-tempered, and poorly fired. The exterior surface is net-impressed, the interior smoothed. The straight, non-everted rim is diagonally impressed. All the sherds seem to be part of a single vessel.

Seven sherds, which seem to be all part of a flat bottom of a single vessel, are buff-colored, made of coarse paste, grit-tempered, and poorly fired. Both exterior and interior surfaces are extremely eroded.

Synthesis

All Madison and Levanna projectile points and the single Steubenville Stemmed point were found above 14" below the surface. All of these point types have been assigned to Middle or Late Woodland periods (Ritchie 1961: 31, 34, 51-52). The pottery recovered from Area A excavations also came from above this depth. It would seem that more than one Woodland component is represented. Unfortunately, the extensive disturbance of this depth zone by plowing activity makes their differentiation impossible.

Bare Island and Bare Island variant projectile points were recovered, in all cases, at depths ranging from 17" to 22" below the surface, in the undisturbed yellow sand (Fig. 3). The Bare Island-Poplar Island Intergrade points came from the same depth range. Associated, by depth, with these points, were the majority of the argillite knives and perforators, a quartzite-limestone conglomerate knife, and a basalt scraper. A great deal of fire-cracked and reddened rock was found at corresponding depths, indicating that hearths were located in the area, though none could be distinguished.

The single Poplar Island projectile point was recovered at a depth of 27" below the surface. The unfinished red argillite point, which could not be classified, was recovered at 33" below the surface. The only other artifacts recovered from corresponding depths were found in a disturbed context and could not, therefore, be associated definitely with these points.

Thus in Area A a well-defined Bare Island occupation zone can be delimited on the basis of absolute depths of material below the surface. At the type site—the Kent-Hally site on Bare Island in the lower Susquehanna River—Kinsey (1959: 129) found Bare Island projectile points in association with steatite bowl fragments. Assuming that, in view of the proximity of the site to steatite quarries, steatite may have been used in the area prior to the Transitional, Kinsey (1959: 129) at first attributed the site to the Middle or Late Archaic. He has since assigned Bare Island points to the Late Archaic (Kinsey 1961: 15).

On the Eastern shore of the Arthur Kill, in Northwestern Staten

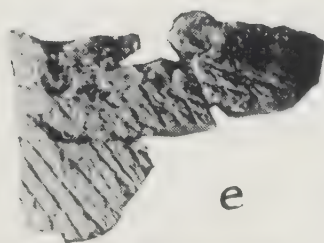
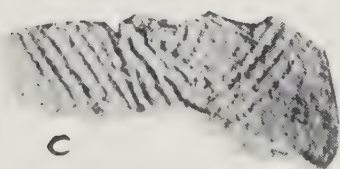
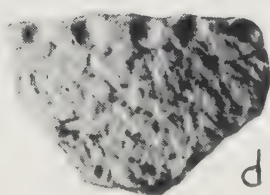
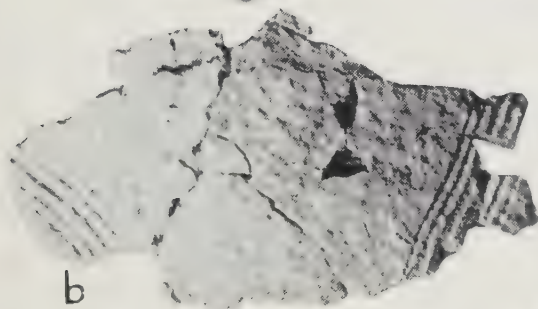
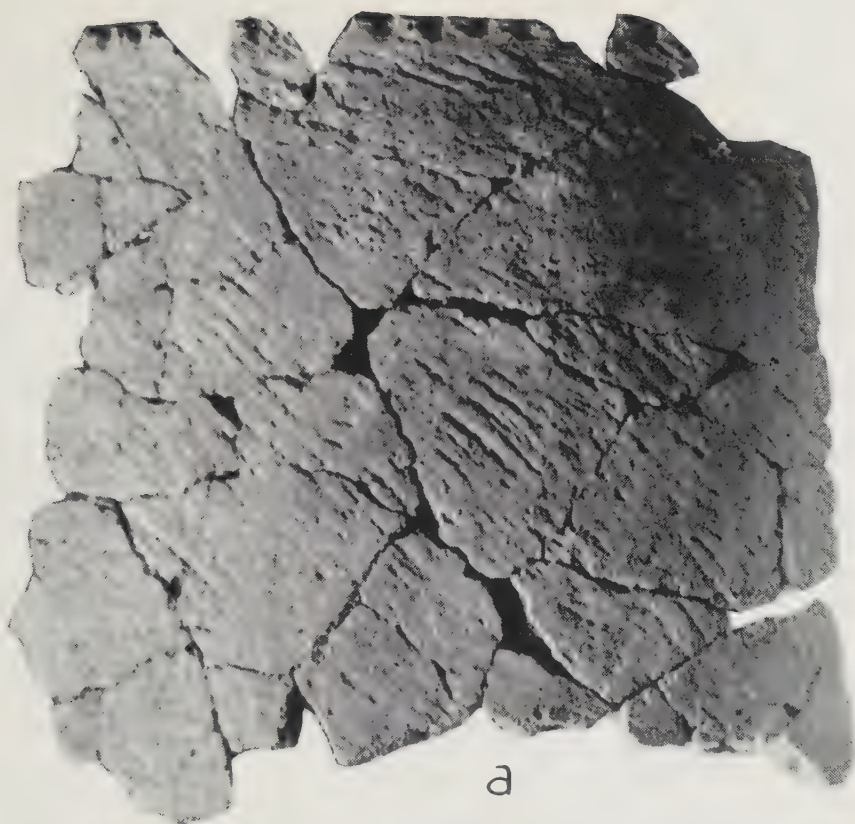


Plate 2

Island, Bare Island projectile points have been reported at the Bowman's Brook A site and the Old Place site (Ritchie 1965: 139).

In New Jersey, projectile points which could be classified as Bare Island in type have been reported from the following sites (Fig. 1): Stobbe (Cross 1941: 33), Indian Head (Cross 1941: 45), Salisbury (Cross 1941: 57), Woodbury Annex (Cross 1941: 70), Koens-Crispin (Cross 1941: 86), Worrell (Cross 1941: 92), Red Valley (Cross 1941: 122-123), New Sharon (Cross 1941: 131), and Abbott Farm (Cross 1956: 82-83). Such points have also been reported at the other New Jersey sites of Buri (Gruber 1956: 16), Florence (Mason 1955: 4-5), R.C.A. (Hartle n.d.), and White-side (Knowles 1950: 13). In all cases argillite is predominant.

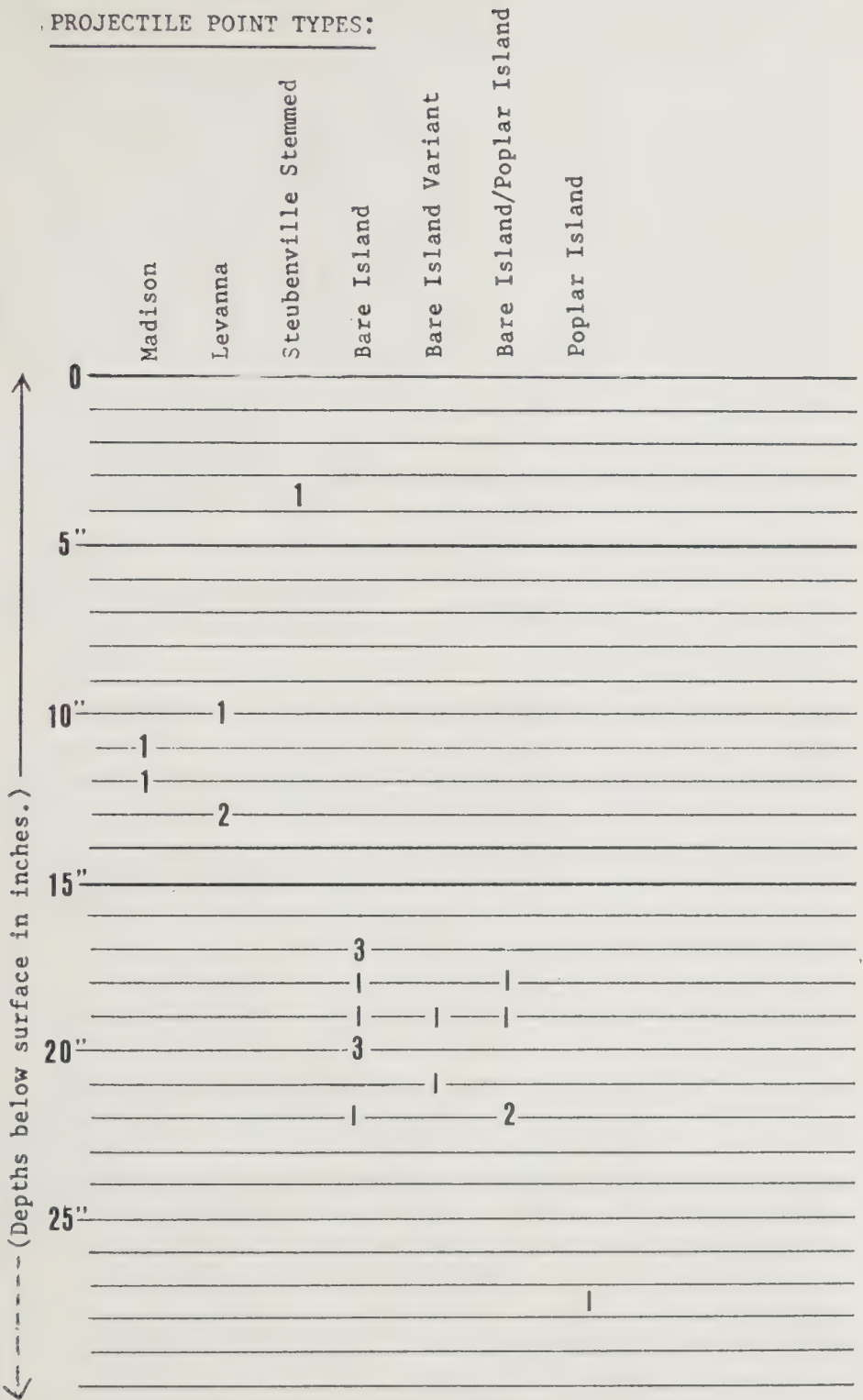
Robert Funk has reported the occurrence of Bare Island points, predominantly of quartz, associated with what he has termed the Sylvan Lake Complex (Funk n.d.: 145). This late Archaic complex has a radiocarbon date of 2210 B.C. $\pm$ 140 years (Y-1536), obtained from the Sylvan Lake Rockshelter in Dutchess County, New York (Funk n.d.: 138). Other New York sites from which Bare Island projectile points are reported include Weinman (Funk n.d.: 48, 52), Dennis (Funk n.d.: 65), and Barren Island (Funk n.d.: 74).

Ritchie (1965b: 135) considers such points to be part of a widespread horizon in the Northeast, encompassing the Hudson Valley, Massachusetts, and Long Island. However, in the opinion of Kinsey, Holzinger, and their associates, the majority of the projectile points from this area are too small to be classified as Bare Island, although there are examples of overlapping and intergrading in the two point samples. Ritchie (1965b: 135) has therefore decided to name the small-stemmed points from the Hudson Valley, Massachusetts, and Long Island as "Wading River" points, since such points were first excavated at the Wading River site on Long Island.

The preference for argillite, whose sources are in the central Delaware Valley, over local glacial pebble chert, for the manufacture of the Bare Island projectile points found on Staten Island, in addition to the closer typological similarity of these points to those recovered from the New Jersey and Pennsylvania sites previously mentioned, suggests Southwestern origins and cultural connections for the Bare Island occupation(s) at Wort Farm.

It is to be noted that all of the New Jersey sites (Fig. 1) from which Bare Island projectile points have been reported are linked by virtually continuous water routes, extending from Staten Island to the Delaware River. The Wort Farm site, on the evidence of the predominance of weapons, knives, and scrapers, along with

PROJECTILE POINT TYPES:



VERTICAL DISTRIBUTION OF PROJECTILE POINT TYPES

traces of hearths, would seem to have served as a hunting camp site, probably recurrently occupied by small numbers of people for relatively short spans of time. The settlement system, of which this site formed a part, might be reconstructed through re-analysis of extant collections and further excavations at Staten Island and New Jersey sites which may be contemporary.

Such a study would be extremely difficult, in view of the absence of natural stratigraphy at the known Staten Island and New Jersey sites and the rarity of recoveries of material suitable for radiocarbon dating. In the author's opinion, however, much could be learned through the judicious employment of artificial levels in the excavation of sites and through careful functional analysis of the material recovered.

Poplar Island projectile points have been reported from a number of sites in the lower Susquehanna River Valley (Kinsey 1961: 45). Since such points were found in association with steatite bowl fragments at the Kent-Hally site, Kinsey (1961: 44) places them in the Late Archaic. On the basis of the evidence from the Duncan's Island site, Witthoft (1959: 83) would place the points earlier in the Archaic.

It has been suggested by Ritchie (1965a: 144-147) that Poplar Island points may precede the occurrence of Bare Island points on Staten Island. This hypothesis is suggested by the results of excavations by Donald Sainz and Albert Anderson at the Bowman's Brook A site. The presence at Wort Farm of a single Poplar Island projectile point at a depth of 5" below that of the lowest depth for Bare Island points recovered may provide some confirmation for the theory of the temporal priority of Poplar Island points on Staten Island.

EXCAVATION AREA B

Stratigraphy

The uppermost 5" to 6" consists of brown sandy soil, considered to be the plow zone. Beneath this is unstratified yellow sand to a depth of at least 50" below the surface. The bottom of the yellow sand layer was not reached in Area B. No artifacts were recovered from depths greater than 19" below the surface, the bulk of the collection from this area consisting of pottery which occurred at depths ranging between 0" and 14" below the surface.

Collection

A single projectile point fragment of purple argillite, which could not be classified, was recovered from the plow zone. It is relatively broad bladed with slightly excurvate edges. The shoulders are weakly defined, the stem

broad. The point measures one inch at the shoulders, the point of maximum width. The cross section is a flat oval. A unifacially flaked lanceolate shaped knife of tan chert (Plate 1: 1) was found at 19" below the surface.

The bulk of the collection from this area consists of pottery, which occurred at depths of 0" to 14" below the surface, all types being uniformly distributed throughout this depth range. A total of 421 sherds was recovered from two contiguous five-foot squares. Of these, nine were too eroded to be at all classifiable. The following classes were distinguished from the remainder. All are coil manufactured.

Two hundred thirty-four Vinette Interior Cord Marked (Lopez 1957: 23; Smith 1950: 195) sherds, all apparently from the same vessel (Plate 2: a), were recovered. The diagnostic characteristics are a tan colored paste, coarse grit temper, poor firing, and exterior and interior cord-marking, with vertical notches on the exterior of the straight-sided, slightly everted rim. The interior cord marking is horizontal, the exterior cord marking being diagonal. Both surfaces appear to have been smoothed over slightly. Some of the sherds show light brushing on the interior surface. The vessel is a straight sided, elongated pot, with rounded bottom. The diameter is approximately 10".

One hundred twelve Windsor Cord Marked (?) (Smith 1950: 194) sherds, all apparently from a single vessel (Plate 2: c), are yellow-buff colored. The thin, fairly hard paste is grit tempered. Cord marked on the exterior surface, the interior is smoothed. The only decoration consists of closely spaced transverse impressions on the lip of the straight, slightly everted rim. The interior surface is smoothed, and in this respect these sherds do not fit the type of Windsor Cord Marked as described by Smith (1950: 194).

Sixty-six Matinecock Point Incised (Smith 1950: 196-197) sherds were recovered (Plate 2: b, c). All apparently from a single vessel, the sherds are orange-tan in color, of fairly fine, grit-tempered paste, poorly fired. The exterior surface is smoothed, while the interior surface is slightly brushed and smoothed. The exterior surface is decorated with groups of six parallel curvilinear or straight lines. The lines were evidently made by the stab and drag technique, probably with a comb. The parallel lines are curved in some cases, straight in others. One sherd shows the apex of a triangular chevron-like outline. This type resembles vessel 3 from the Pelham Boulder site described and illustrated by Lopez (1958: 4). Lopez remarks that these sherds were found at the Pelham Boulder site in a level which also produced sherds "with dentate stamping, net impressions and fabric markings, all with early Windsor paste characteristics," (Lopez 1958: 4). This is a context analogous to that in which such sherds are found at Wort Farm.

All of the pottery types recovered which could be identified have been assigned to the North Beach focus of the Windsor tradition by Smith (1950: 135), which would indicate that this occupation of the Wort Farm site dates to the Early Woodland Period.

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THE STATEN ISLAND INSTITUTE OF ARTS AND SCIENCES ARCHAEOLOGICAL COLLECTION

by JOHN COLE

The archaeological collection of the SIIAS consists of several thousand artifacts of stone, pottery, bone, and shell from approximately 70 sites and areas on Staten Island. In addition there is a large amount of material whose provenience is unknown, and there are hundreds of items from various places ranging from Persia to Ohio to Peru to Florida. Working for the Museum as a New York City Urban Corps Intern from November 1967 through January 1968, I have been mainly concerned with the Staten Island material—probably the most significant part of the collection. Appended is a list of Staten Island sites, areas, and small-finds locations represented in the collection. Travis, Fort Wadsworth, Ward's Point, and Old Place Sites and Rossville, Lake's Island, and Mariner's Harbor Areas are the best-represented sites and areas, although others are important, too. Many of the localities with very few artifacts are of value as hints of where more material may be found or as evidence of the distribution of particular artifact types. The larger sites, especially, show evidence of continued occupation or reoccupation over thousands of years while men made the transition from being hunters and gatherers to the settled village farmers and traders the Dutch encountered in the Seventeenth Century.

Although the collection spans the past ninety years, a great part of the material was acquired by the Museum between 1876 and mid-1941; what has not been placed in display cases has been in more or less untouched storage for many years, uncatalogued and unanalyzed. Much of the material is from the Burgher (a gift to the Museum in 1959), Skinner, and William T. Davis private collections; other private collectors also contributed. Unfortunately, the artifacts generally were not stored in labeled units, so it is frequently not clear which artifacts are from which collections and sites. Luckily, many early collectors followed the practice of labeling individual artifacts with site and occasionally even depth and date information. This, and an early partial cataloguing system, have enabled me to sort much of the material according to provenience and to catalogue it accordingly. Ideally, an artifact's archaeological context beyond mere site designation should be known, but unfortunately early archaeology was often imprecise. Even if excellent records were kept in some instances these have often not been published or otherwise are lost to the present-day researcher. An exhaustive search of the literature should fill some of these gaps, however.

Even assuming published sources and old references or notes are *not* found to be helpful to any great extent, the collection itself remains valuable. It is often the only evidence we have of now-destroyed sites. The artifacts can be treated essentially as surface finds, although many were no doubt found underground, whether by controlled excavation or random digging. We know vague horizontal locations but not vertical relationships. Therefore a given site collection must be regarded as a sort of undifferentiated cross section of the cultures that lived and left material remains there. Ward's Point, for example, includes artifacts ranging from Archaic through Woodland to relatively recent historic Dutch trade items such as clay pipes, beads, and musket balls. A site by site typological analysis will give valuable information about the age, duration, and type of habitation(s) of each site. A lithic analysis will often be able to trace early trade routes by determining from where various stone types came if they are not indigenous to Staten Island (many are not). Cultural affinities with other areas may be found by comparing tool and ceramic types, and, within a particular site, typological analysis and seriation of tools and ceramics will provide valuable information about the economy and time period of the Indian inhabitants.

A serious flaw in the collection is that it consists mainly of projectile points and axes—two tool types which were recognized easily and overly-prized by early archaeologists. Too often equally, or more, valuable scrapers, punches, gouges, denticulates, and the like were overlooked, as also were waste flakes and cores. Consequently the collection is probably imbalanced in favor of only the most obvious tool types. But we must work with what we have rather than what we lack. The collection *has* one of the largest samplings of early New York City archaeology, and combined with more current work by New York University, Columbia University, the Brooklyn Children's Museum, and other institutions, the SIIAS collection should do much to further man's knowledge of his prehistoric past on Staten Island and New York by complementing current professional field work.

CATALOGUE OF SITES REPRESENTED IN THE COLLECTION

Sites with complete numbers such as Std 1-3 have been mapped and filed with the State Archaeologist in Albany. Other sites have been given temporary identification numbers such as Std MH either because they are new or unregistered sites or because, like Mariner's Harbor, they are large, vague *areas* rather than specific sites. Many of these "sites" may later be found to be synonymous with all or parts of other sites.

The numbers in parentheses after each site are the numbers of *catalogue* items for the site. This is not necessarily the total number of artifacts, because undecorated potsherds, flakes, cores, and unworked bone and shell have been bulk catalogued.

Std A-1	Arlington (21)	Std ND	New Dorp (1)
Std 7-1	Arlington Station (1)	Std NS	North Shore of
Std 25-4	Arrochar (5)		Staten Island (2)
Std AV	Avrieville (1)	Std O	Oakwood (1)
Std BC	Benedict's Creek (6)	Std OT	Ocean Terrace (1)
Std B	Beulah Point (2)	Std 4-1	Old Place (103)
Std BL	Bloomfield Area—see Watchogue also	Std OW	Old Wagon Road, Richmond Kill (1)
Std BH	Billopp House (5)	Std PR	Port Richmond (1)
Std Bog	Bogardus Corners (2)	Std PV	Pavillion Hill (1)
Std BPt	Bowman's Pt. (4)	Std PF	Prall's Fever, S.I. (2)
Std BU	Bull's Head (6)	Std PI	Price's Island (2)
Std Can	Canarsie, S.I. (1)	Std PB	Prince's Bay Area (3)
Std CBA	Carlton Blvd. & Arthur Kill Rd. (2)	Std RI	Richmond (21)
Std CA	Carrettsons (1)	Std RV	Richmond Valley (6)
Std CP	Castleton Ave. & Palmer's Rd. (1)	Std RB	Rosebank, S.I. (1)
Std 21-3?	Charleston? (3)	Std RO	"A*1-Rosseak"? (1)
Std 20-3	Chelsea (12)	Std R	Rossville Area (53)
Std C	Clifton (2)—see also Fox Hills	Std BS	Corner, Sand and Bay Streets (1)
Std CL	Clove Valley & Clove Lake (3)	Std SG	Sandy Ground (2)—see also Rossville
Std CI	Crook's Isle (1)	Std SL	Silver Lake (1)
Std Court	Court House—field near it (1)	Std 14-3	Smoking Point (1)
Std E	Erastina (11)	Std SA	South Av., S.I., Railroad Cut (1)
Std 24-4	Fort Wadsworth Military Reservation (83)	Std SV	Springville (7)
Std FH	Fox Hills (5)	Std ST	Stuyvesant Place (1)
Std GF	Giffords, S.I. (1)	Std SGC	Sylvan Grove Cemetery (1)
Std GK	Great Kills (3)	Std Todt	Todt Hill (1)
Std 19-3	Greenridge (12)	Std 28-3	Travis (725 so far— about 60% catalogued)
Std HH	Holland Hook (6)	Std VM	Vanderbilt Mausoleum, Moravian Cemetery (1)
Std HSP	Horseshoe Spring near Silver Lake (1)	Std 1-3	Ward's Point (636)
Std H	Huguenot, S.I. (2)	Std 27-3	Watchogue (uncatalogued)
Std HB	Hylan Blvd. (3)	Std WNB	West New Brighton (17)
Std K	Kreischerville Area (38)	Std W	Western S.I. (76)
Std L	Lake's Island (148)	Std 26-3	Woodrow (33)—also called Sandy Brook
Std MH	Mariner's Harbor Area (173)	Std WA	Woods of Arden (24-4)
Std N	New Beggars Pt.? (1)	Std 2-3	Wort Farm (5)
Std NB	New Brighton (7)—see also West New Brighton		

Hundreds of artifacts, labelled simply "Staten Island," remain uncatalogued.

John J. Crooke:

*An Engineer and Naturalist
of the Nineteenth Century
in New York and Colorado*

by NANCY DECKINGER

Although secondary sources that discuss the Crooke family were available, this account of the Crooke family's attitudes and achievements is based solely on the personal papers of John J. Crooke and letters and documents of the Crooke family. In this way it has sought to be unique and hopefully successful in describing a family typical of an era that time has invalidated.

The Crooke family letters are a collection, for the most part, of correspondence with John J. Crooke (January 22, 1824–April 22, 1911). Enclosed with these letters are memorable clippings, samples, advertisements, and posters, relevant to the Crooke family's history, attitudes, interests, and businesses.

Among the many documents in this collection is the Crooke genealogy. From this record, we learn that in 1601 John Crooke was Recorder of the City of London and Speaker of the House of Commons. In 1641, Sir George Crooke sat as a judge during the reign of Charles I. Lt.-Col. Charles Crooke was a Cavalier during Cromwell's reign in 1651. Three years later, it is recorded that Major Fenton Crooke was an officer in Oliver Cromwell's army. The last of the English Crookes to be recorded, Sir John Crooke of Ais-bury, was a Member of Parliament from Buckinghamshire. The Crooke family genealogy also includes a record of the "American Branch." John Crooke came to America from England in 1670.¹ The Crooke letters themselves contain occasional references to this ancestor. One letter (dated Sept. 4, 1869) from Henry Crooke to his brother, John J. Crooke, mentions that John Crooke's "... name appears upon the records of the incorporation of the Trinity Church."² The official genealogy bears this out and adds that John Crooke was a vestryman and later a warden in that church. He was also a subscriber to the original building. We also know that a Charles Crooke helped to found the "old Christ Church."³ Julia writes to her brother (Oct. 29, 1903), John J. Crooke, that "as a history of the Christ Church is being written, many inquiries have been made about Charles Crooke," as he "... was one of the subscribers to the building fund, and his wife gave the crimson damask

hangings. . . .”⁴ Later more will be said of John J. Crooke’s church activities.

On Jan. 8, 1738, it is recorded in the Secretary of State’s Register, that a Robert Crooke and a Charles Crooke owned much land, in an area called the “Great Nine Partners,” in Dutchess County.⁵ That the Crooke family still had an interest in this property is proven by the fact that Julia Crooke sent to John J. Crooke a copy of the *Poughkeepsie Morning News* dated February 4, 1869. It contained a legal announcement that the Town of Hyde Park, formerly called the “Nine Partners Patent,” was to be sold soon.⁶ The title, “Nine Partners,” has been kept alive to this day as “Nine Partners Road” in Dutchess County.

This background information serves to account, in part, for the heritage the Crooke family had and the attitudes they lived with that were shaped by this heritage. By reading statements from the Crooke family correspondence, we can infer that the Crooke family was influenced by Populism and the Protestant Ethic.

Like so many other Populists, the Crookes were wealthy and sought to become even wealthier. They blamed the “millionaires” and large trusts for their problems. They were appalled by the corruption in business and politics. Julia, writing to John J. (dated May 31, 1906) says, “What a scandalous age we live in . . . as for the trusts, they are a bad lot. . . .”⁷ There was a genuine bitterness toward the “robber barons” of that era, which Julia’s letters typify. For example, John J. was an accomplished scientist (something that will be discussed in more depth later). On hearing that he was about to publish a book on natural history, her response (dated Jan. 9, 1906) was, “I hope there may be a boom in Natural History books when yours are sold—and that the ‘rich thieves’ will pay a large sum for them.” In another correspondence (dated Feb. 10, 1905) to John J., she verbalizes the underlying theme of the Populists, the desire to return to a local, agrarian economy. She reflects, “Give me the peaceful, quiet old days, when every man had a chance to make a living if they were able to work.”⁸ She adds one more specific comment, aimed at the “robber barons.” Written on Dec. 8, 1908, during the “trust-busting” campaigns, she says, “After the cleaning up is done, the world ought to be freer from millionaires than it is at present and I hope Carnegie will continue to think it a wicked thing for a man to die ‘awful rich,’ though he has a good deal to do before he can escape that. . . .”¹⁰ We also know that typical of the Populists at the end of the nineteenth and the beginning of the twentieth centuries was a strong xenophobic attitude. Julia writes to her brother, May 7, 1880, “The daily incoming of the Irish and Dutch immigrants is causing an overpopulation prob-

lem. They make me feel 'smothered.'"¹¹ Although it is true that in the 1880's immigration reached great heights, still we must conclude that the country, objectively speaking, did not suffer due to any "over-population." From one example of an Italian boy shooting an American boy Julia concludes that all foreigners are "wicked." Due to this incident, she would like to have a law passed that would prevent "... every murderous foreigner from carrying knives, razors, or pistols, and using them whenever their fancy pleases."¹² Julia (from whom we have many letters) writes, on the death of the Pope, "Yes, the old Pope was, for a Pope, a better man than most, but I guess a good deal of his 'last words' were manufactured for him by those interested in the success of the Roman Church, what struggling there is going on among the Priestly crowd behind the Vatican walls."¹³ This proves to be an interesting charge. It serves to typify the "Protestant American's" fear that the Pope, represented as a foreign ruler, had no right to "sovereignty" in any way in America. And John J. Crooke's brother, Henry, offers a comment which strings together certain Populist beliefs. He writes, on Aug. 26, 1880, "By the great God, there is no honesty left in the majority of the people in this country, what with the Jews and the Yankees, things are down to a fine point all around."¹⁴ Thus we see Henry combining two forces he partially feared and partially hated. The Jews and the Yankees (i.e., Northern bankers) are combined and a scapegoat is produced.

Engrained in the "Protestant Ethic" is the idea that one must make money for the sake of making money. Thrift, above all else, is valued. With this in mind, we can better understand Julia's remark (Sept. 29, 1875) to John J., "I don't believe a Crooke could ever keep money long enough to be attached to it."¹⁵ And since any spending of money is feared, we can understand Julia's constant and melodramatic fear of being "penniless." Another facet of the "Protestant Ethic" is the respect for hard work. Henry typifies this. He had gone down to Florida for a vacation, but guiltily writes to John J. that "... one lives as long as a week here having nothing but his personal wants to look after. No honest man can bear this sort of thing." Julia, who obviously knows her brothers well and sees that they are controlled by this "Protestant Ethic"¹⁶ (not that she is not), writes to John J. (June 11, 1880), "I hope and pray the day may come when the Crooke boys old and young may find time and pleasure in something besides hard work."¹⁷

These preceding factors that contributed to the Crooke family's political and social attitudes and the history they left could only be discovered through reading the personal correspondence among the members of the family. And it is only with the background

provided by these letters, that we can accurately understand and record the significance of the diverse and sundry business, religious, and scientific dealings of the Crooke family.

Perhaps the most dramatic of the Crooke business ventures were the Crooke silver mines in Colorado. Although four Crooke brothers were involved with the mines (John J., Robert, Lewis, and Henry), John J. Crooke was actually in charge. From the letters, we know that he spent considerable time in Del Norte, Colorado, where the Crooke mines were located. From John J. Crooke's legal papers and mining reports, we know that he owned the North Star Mine, the Royal Tiger Mine, and the Polar Star Mine and Mill. We also know that he was President of the North Star Mining and Smelting Company, and that he founded the Crooke Mining and Smelting Company (which not only had an office in America, but had one in London as well).¹⁸ And enclosed with Crooke's business papers was a "Message to the First Legislature of the Assembly of the Territory of Arizona," delivered by John N. Goodwin, Governor of the Arizona territory. This was dated Sept., 1864. Later, John N. Goodwin was President of the Crooke Mining and Smelting Company. Along with this information was a detailed genealogy of the Goodwin family.¹⁹ This is an example of the many relevant documents and items found incidentally in the Crooke family papers. John J. Crooke was the General Agent for the Ute and Ule mines, and the Crooke brothers owned a part of the Little Annie mine and the Tiger Mill and Mining Company. For proof of ownership, in most cases, we have the mining deeds and other papers for the specific mine. In addition to these many mining ventures, we have printed matter mentioning a "Crooke City" in that area, and in one case, John J. Crooke is advised to change the name of Crooke City to "Tompkinsville," in order to appease a business acquaintance, Mr. Tompkins.²¹

Until 1896, the mines were doing very well. On Sept. 1, 1869, Henry (who was in charge of the Crooke foil company in the East), suggests to John J. that some workers be transferred to the mines in the West, from the factory in the East.²² They were obviously putting all their efforts into the mines. On May 31, 1879, a J. S. Reef writes to Lewis Crooke that the "North Star mine's prospects are excellent."²³ We also have two clippings discussing the success of the Ulay mine. Since the Crooke mining reports for the Ulay mines are dated in the early 1880's, the date of the clippings can be approximated at that time. One quotation will suffice to judge the relative success of one of Crooke's dealings. "The Ulay will soon become one of the greatest producing mines in Colorado."²⁴ Herbert Strickland, reporting on the "North Star" and

"Tiger Mills" mines (March 16, 1882) concludes that "Since these mines are near the rising town of Silverton, which fact alone justifies me in saying that its value is ever increasing at a rapid rate."²⁵ Later in 1882, Mr. M. J. Garrett writes that the mines are "in splendid condition."²⁶

John J. Croke was also a scientist. He had patented methods for the extraction of certain metals. He writes to Mr. I. Nickelson, in the West (on March 19, 1887), that he should confine his efforts towards the extraction of silver.²⁷ However, in 1896, a drastic change took place in the success of the silver mines. J. L. Hill writes to his uncle, John J. Croke, that the company is in debt.²⁸ Another nephew, Will Croke, writes to John J. Croke, on Aug. 19, 1897, "Business and money are difficult to obtain."²⁹ Three days later, he writes his uncle again, "Close mines at present. Silver at such prices impossible to make money."³⁰ Just a little later, Will writes to John J. Croke that he is looking for gold in the locality, although he is still trying to keep the silver mine.³¹ On Aug. 13, 1901, Robert Croke writes to John J. bad news about the Polar Mine. The offer had not been made, they could not sell it.³² Robert, still reporting on the Polar Mine, on Aug. 30, 1901, states that business is not progressing.³³

The Crookes were typically Populist in another way. Like other Populists, as owners of silver mines, they depended on the silver standard for money. When, in 1896, McKinley was elected to the Presidency, the nation went on the gold standard. And, as Will writes, July 17, 1901, summing up the problem, now that a "gold" man is President, "owners of silver mines might as well give up the fight."³⁴ However, they did struggle, and as late as Dec. 3, 1904, Julia writes to John J. of a Mr. Muller who is still trying to make a profit out of the mine, although things are going poorly there.³⁵

However, the Croke family had other businesses. The John J. Croke Company, Tin Foil and Bottle Caps, was very successful. Although John J. Croke was the President of the company, Lewis and Henry were more active in it. As early as Sept. 25, 1869, Henry writes John J. that he is experimenting with the manufacture of colored foil.³⁶ On July 12, 1877, he tells his brother that the colored foil is in immediate demand.³⁷ On Aug. 12, 1879, Henry complains to him that the presses are only making smooth foil.³⁸ (We have samples of Croke's smooth foil that were found among his letters.) Then, on July 6, 1880, Lewis Croke and Henry Croke patent the "Art of Making Ornamental Foil." Samples of this ornamental foil appear on the back of official Croke envelopes, which were found among John J. Croke's letters, just one of the many living records Croke left. Henry, writing to John J. on June 15, 1881, demon-

strates the success of this newly patented foil. He says, "... we have all we can do and are increasing the plant as soon as possible."³⁹ In 1895, Henry writes to John J. that the foil business is good⁴⁰ and in 1899, he is working on perfecting a foil press.⁴¹ Nothing in the Crooke letters suggests that success in the foil company did not continue.

John J. Crooke, in addition to being a successful businessman, was an accomplished naturalist and inventor. He was a member of the Horticultural Society of New York, the Torrey Botanical Club, and the Colorado Scientific Society. He was a Fellow at the Museum of Natural History and the Lyceum of Natural History, and was asked to become a member of the New York Academy of Sciences. From a letter by N. L. Britton, Sec'y of the New York Botanical Garden, thanking him for his gift, we know that John J. Crooke donated his herbarium specimens to the Botanical Garden.⁴² Julia commends Crooke on another scientific donation. He gave his botanical collection to the Natural History Society of Staten Island. (The letter is dated Oct. 14, 1907.)⁴³

When his brother Henry was vacationing in Florida, he constantly sent John J. packages of plants.⁴⁴ Henry, also interested in natural history, had "... become an expert at peeling birds."⁴⁵ John J. Crooke invented and patented the Crooke fertilizer.⁴⁶ John J. Crooke also invented a brick which was tested by the Standard Fire Brick Company. The President, F. L. Capers, wrote him (April 15, 1895), that the brick test had "very positive results."⁴⁷ Enclosed with this letter was a letter from T. W. Robinson, the General Superintendent of the Standard Brick Company. His comment was that Crooke's brick "... compares very favorably with the best grades of eastern manufacture."⁴⁸ He had a letter of congratulations from Jesse C. Bennett (June 11, 1902) for his successful invention of a dynamo.⁴⁹ Crooke also invented some processes for extracting metal from ores (which helped him with his silver mines). The two most important aspects of this, which Crooke felt were worth patenting, were "... the use of Nitrate of Copper (sic) as an oxidizing and chlorine producing agent and the use of nitrate of copper in both the silver and the gold processes."⁵⁰

But John J. Crooke was not just a man involved with business and science. To some extent he carried on his family heritage of interest in and support of the church. He was elected a warden of the Church of the Holy Comforter in Eltingville, in 1866⁵¹ and 1867.⁵² In those same years he was also chosen as a delegate to the diocesan conventions.^{53, 54} In addition, he gave donations to St. Andrew's Church, also on Staten Island.⁵⁵ And finally, among his personal papers, we found a copy of the *Del Norte Presbyter*, March, 1876.⁵⁶

This newspaper was the "first religious paper in the San Luis Valley," and it is therefore a reflection of Crooke's interests that he should have kept it. John J. Crooke was not an unwilling victim of the Protestant Ethic; he believed in it and lived it well.

And Julia, for all her harshness and prejudicial attitudes, was herself a very sensitive person. Although she complained much about sickness in the family, she was unavoidably caught up in it. She writes, Aug. 11, 1885, "I sometimes feel as if to me life has had but little else in store but to watch the sick and the dying."⁵⁷ And she writes on Aug. 12, 1908 (one of the last letters we have from her), "... I think there is a subdued, and comprehensive sense of what is lovely in nature, that comes to us in old age. . . ."⁵⁸ Although many times she regretted her old age and the pain that accompanied it, she could also, at times, value it. And Julia had an amusing side too. She encloses a clipping about attempts to divert Fifth Avenue traffic via a Forty-Second Street Bridge.⁵⁹ This plan caused quite a lot of argument between the politicians and the New York City merchants. In response to the arguments, she writes her brother on Aug. 31, 1903, "... the internal and external swearing must have made the devil rejoice, if there is any such party, I don't believe."⁶⁰

Thus, we have attempted the re-creation of the attitudes and achievements of a family, molded by the times, imprisoned by the times, and possibly a tribute to their times, through the use of the Crooke family letters and documents.

Footnotes

The Crooke collection has been maintained in the same order in which John J. Crooke left it to the Staten Island Institute of Arts and Sciences. John J. Crooke had organized the hundreds of items in certain groupings. Since these were left the same, after being read, they were catalogued according to the original groupings. These footnotes therefore merely denote the form of identification that was used to order the collection.

1. BB-24	16. CC-10	31. CC-15	46. Q-54
2. X-15	17. U-18	32. CC-25	47. V-15
3. BB-24	18. BB-23	33. CC-27	48. V-16
4. Q-83	19. BB-25	34. CC-30	49. P-14
5. BB-24	20. BB-1	35. Q-71	50. V-12
6. S-38	21. CC-12	36. X-43	51. S-25
7. Q-94	22. Y-14	37. CC-8	52. BB-36
8. Q-44	23. BB-5	38. W-10	53. BB-37
9. Q-64	24. BB-42A	39. AA-13	54. S-36
10. Q-43	25. AA-12	40. X-35	55. BB-18
11. W-27	26. U-25	41. W-22	56. M-97
12. Q-26	27. CC-23	42. BB-9	57. Y-1
13. Q-62	28. V-22	43. Q-21	58. Q-31
14. U-2	29. CC-13	44. X-75	59. Q-36B
15. CC-21	30. CC-14	45. X-87	60. Q-36A

Rough Notes of a Rough Life in

Colorado 1880.

J. I. Crooke

Editorial Note: This document was transcribed from the original diary. The only materials which have been deleted (as indicated by: . . .), include sections referring to technical activities or to lengthy technical descriptions. The author's style has been kept as to punctuation and abbreviation although capitalization has been made consistent and contemporary spelling of mineral terms has been substituted.—G.K.S.

1880: *July 9* Started for King Solomon Mountain. Crossed the range and head waters of the Animas River on my horse "Red Billy." Reached Silverton that night and put up at my old friend Captain Walkens Doggery. *July 10* Took the trail (which is about 4 miles long) up the Mountain. At timber line encountered a violent snow storm. Reached North Star Mine about midday. Passed the night on the mountain at an elevation of 13,000 feet. Violent gale all night and very cold. Clothing wet and everything uncomfortable. *July 11* Went through the mine. Fine vein of sulphate-carbonate and sulphide of lead carrying silver in quantity. Main vein about 5 feet wide. The view from old King Solomon is grand and impressive. A wide expanse of mountain peaks hoary with the snow of ages. About sundown started down the trail. Reached Silverton 8½ o'clock. *July 12* Alcote and myself located a fluor spar vein about a mile north of Silverton . . . Called it the "Porvenir" or good luck lode. Slept that night at Cap. Walken. *July 13* Started for the Lake Fork of Gunnison River, 36 miles distant. Reached home at 9 P.M. Red Billy came in as fresh as a daisy.

July 18 Red Billy and I took a run up Wades Gulch to the Crown Mountain iron mine, elevation 11,000 feet. Directed the work at the mine. Heavy patches of snow are still lingering thereabouts. *July 20* Another trip with Billy up Alpine Canyon prospecting for iron ore. There are about 300 tons in a bed lying at the foot of Red Mountain 3 miles from Henson Creek, at an elevation of about 10,000 feet. Found the mountain mosquitoes in force, and dreadfully hungry. Was caught in a violent storm of rain with hail. Crossed over the east side of Red Mountain which is covered with an immense slide of ferruginous quartz rock. Ate my lunch on the mountain, and reached home in the afternoon. *July 21* Went through the Ulay mine. Four stopes running on 4th level. 40 feet from breast the vein has swollen to a width of 11 feet. 5th level in 15 feet, drifting east and west, mineral in both drifts fine, pay-streak 30 inches. Bottom of 5th is 195 feet from surface. Shipped 20 tons of lead today on one bull train of 11 wagons. Cast two bars of silver weighing 198½ lbs. or 2869 ounces Troy—carrying 9¼ oz. of gold. *July 22* Everything at the works being in good running order, concluded to make a prospecting trip for iron ore. Mounted Jim Stillman with the tools on the Joe stallion, and took Red Billy to carry myself and the "grub". Went up Wades Gulch for about 3 miles and picketed the animals in a clump of spruce, and started up a gulch running westerly toward the north side of Red Mountain. Skirted the slide for a long distance and passed into a heavy wood of spruce and pine, mostly *Abies Englemanni*, *Abies Menziesii*, and *Pinus Contorta* with its variety "Latifolia". Some of the Englemanns spruces were over two

feet in diameter, all of them magnificent trees. Bore northwest through the forest for about a mile and reached an open park—a lovely spot containing probably 500 acres of luxuriant bunch grass kept green and lush by two cool springs of water situated at the head of the park on the edge of the wood. Passed on over the gently sloping meadow down to where the mountains narrowed and into what is called in this country a “swag”, meaning a sloping damp piece of ground. Then commenced the labor of prospecting. Holes were dug at intervals and all traces of iron carefully noted. We kept working down the “swag” until we finally struck the ore in large masses and of excellent quality. This was a great find, and a full reward for a hard days work. Took bearings of the lead by compass, wrote the notice and staked the claim. I called this mine the “Julia” after my dear little sister at the far away home. Made a bee line over the mountain for the spot where we had corralled the horses and reached the Gunnison River in time for supper.

July 23 Took bearings yesterday by a notched peak and a green spot on a mountain opposite to find the mouth of the iron gulch by way of Alpine Canyon. Started this morning and found the gulch and reached the mine. Distance about $1\frac{1}{4}$ miles from Alpine. Looked over the ground for a road—good grade—and can be reached from the Alpine Canyon. Prospected the mine more thoroughly. Found large masses of very superior ox iron. Ate today the wild mountain strawberry which I take to be the *Fragaria Vesca* S. The fruit is long and slender, an acute cone about $\frac{3}{4}$ of an inch long by $\frac{1}{4}$ of an inch broad. Acid and not very strawberryish, but very nice for all that. Went home through a good drenching rain, Billy stepping off to the wild music of the spiteful mountain thunder. *July 24* Took two men up to the iron mine, dug holes and finally found the ore in place. This makes a mine of it. The ledge lies from two to four feet under the earthy covering. Saw the spoor of blacktailed deer, wild cat, mountain sheep, and mountain lion in great abundance. Found the ground frozen today for about a foot in depth. These dark canyons hardly lose the memory of winter from years end to years end. Picked up several uncommonly large snail shells—*Helix Strigosa*, Gould. Went home again through a black thunder storm. This is the rainy season. *July 25* The 25 horse steam hoister for the mine, the 30 horse engine and boiler with the No. 5 Baker blower for the blast furnace came in with mule train today. They came through from end of railway to this place in 11 days. . . . *July 28* Have the engine and boiler in place and ready to make steam and water connections. Brockett was up today pretty drunk, and told me confidentially that I was the father of the whole San Juan country. I told him the country had enlarged the circle of relatives, and that just now I was in close connection with a certain uncle, Uncle “three balls.” Brockett is a first rate fellow when he is drunk. I have never yet seen him sober. . . .

July 31 The machinery all in place. *August 1* Put water in the boiler. Went up to Ulay mine. All workings in fine condition. Went to the Julia iron mine. The developments show a large body of ore. . . . *August 3* Running engine to get smooth wearing journals, as when she starts, her journey is long—no stopping to arrange straps or to cool off bearings. We melted 165 lbs. of silver to day, equal to 2389 troy ounces. This silver contained 7 oz. gold, and was cast in one bar, the largest ingot we have ever made. *August 4* At the mine all day putting up the new hoisting engine. Made all the connections. Everything ready for work except the water tank. All this new machinery has been a great bother because of the carelessness of the people who neglected most shamefully to see that proper connections—pipings and valves—were sent out with engines and boilers. The old story, idle foremen and pleasuring bosses. . . . *August 8* Concluded to make a search today for a certain quartz ledge on the mountain range in the vicinity of Red Mountain, the float of which I had observed on a former trip. Took Red Billy with Jim on the Scott horse and started up Wades Gulch. Followed the gulch to the first crossing of the stream, turned to right sharp and put up the mountain. Soon struck a trail, followed it, passed up again over a bare bench, struck

another trail, and finally after an hours ride reached the top of the mountain. This, the apex, proved to be an open park, very lovely, with large trees standing at intervals. Kept on in a northwesterly direction for half a mile, when the park narrowed and terminated in what we would call on the Coast a sand dune. This dune had a downward inclination, and was trodden all over with the tracks of animals. I could not make out at first what it meant, but directly Jim, who is an old mountaineer, remarked, "a sheep slide," "they come here to play." I have seen otter slides, but I didn't know before today that sheep, "*Ovis Montana*" were up to such pranks. We passed the sheep slide and went on over a deal of rough and broken ground, and finally entered another large park, the view from which was lovely beyond description. Towering mountain peaks on every slide, many of them snow clad on their serrated sides. One may view these mountain scenes every day, and yet even with the roughest they will command a certain natural tribute of homage. We finally passed into the gorge and found the quartz float of which we were in search. We tracked the float, first up the mountain, supposing it came from a certain peak. I even found the float running into a porphyritic quartz. Went down and tracked it north—the same result. We had then cut it off from two directions. Went into the gulch and lined the glacial flow by compass—NE. I was then bothered for there was no likely place from which the rock could have travelled in that direction. In front was a "hog's back." I examined the float carefully, and found pieces weighing perhaps 500 lbs. with sharp edges, and so concluded that by their not being worn they had not been carried very far. Examined the "hog's back" and soon found it to be the very ledge we were in search of—a large dyke of broken down quartz covered with earth. Took numerous samples and started for home. In these solitudes one cannot but remark the absence of animal life—plenty of black flies and mosquitoes, very few birds, an occasional squirrel if not too high up, a coney now and then, but as a general thing very little life. The camp bird is a feature. As soon as one sits down to take a lunch they come in—no one knows from where—but when the grub shows up they are on hand for the crumbs. They are half the size of a pigeon, and very tame. This winter, when up on the mountain eating my dinner, I had crackers for desert. I held up a piece and one, more bold than its fellows, a female actually, took the rare bit directly from my hand. There was confidence for you, but it was a female bird. I tried several males with larger pieces—not any. Their wives might, but they preferred to go hungry rather than trust one of their own sex. Arrived home in time for supper, with Billy shaking his head. Bill always shakes his head when the trail is bad. . . .

August 11 Took Jim Stillman with buckboard, saddles and grub. Started for the Cimmarron Gold mines. Up Henson to saw mill gulch, thence to our "Iron Farm." Took saddle over the Uncompaghre pass. No trail at this point. Reached the basin lying at the foot of the great mountain. Saw here thousands of the rare butterfly "*Parnassia Smitti*." Elevation about 11,000 feet. Passed on over and along "Cow Creek," a tributary of the Cimmarron, and finally reached that stream. Distance about 20 miles from the mill. Scenery magnificent, grand mountains, wild, and awful—great gulches filled with snow and ice. Went to the Conklin mine high up the mountain, 1000 feet above the Cimmarron Creek, panned the vein matter in pay streak from 15 inches to 3 feet. Gold very abundant in arborescent form. The yield of two pans was about half a thimble full of gold. The land is soft and talcose. Walls decomposed schistose granite—gold visible to the eye—cap rock dolomite. Placer washing and sluicing going on below at the edge of the stream. A great many people prospecting. Camps all about. Started late in the afternoon for the cabin at the iron mine. Slept on the floor. Went back next morning to the Cimmarron—took a quarter interest in the Key West, an extension of the Conklin, for which interest I am to run a cut of 20 feet. Took a quarter interest in a lead near the Conklin on the same terms. This last was located as the "Arctic" mine. In going to look at this latter mine, fell with one leg into a chasm through

the thin shell of a glacier in the gulch. These glaciers melt away beneath, forming great caves. Cut my hand, and was glad that my body did not follow my leg. Gold everywhere—colors can be got in panning all along the stream. The Conklin dirt runs from 1,000 to 6,000 Dollars per ton. While on the mountain a great storm of hail came on, such storms as are only known in wilds like these. Started for home on the 12th. Made the cabin late in the afternoon through a severe storm, reached home about dusk. . . .

August 19 Examined the Ulay mine. Went down the main shaft to bottom of sump—distance 201 feet. New hoisting engine works in a satisfactory manner. Vein on 5th level looks well. *August 21* Went up into the east park to coal kilns. A large portion of the charcoal used in our blast furnace is burned in brick kilns—bee hive shaped. Each kiln will prepare about 1,000 bushels every eight days. This is the “carbon rouge” of the French burners. The coal is purchased by measure 2,700 inches to the bushel and costs 15 cts. per bushel=20 dollars per ton.

August 22 Visited with my brother Robert the “Crown Mt. iron mine.” The workmen have about 600 tons out. The mine looks as tho’ it might be very productive. Some 3000 tons of ore in sight of good quality. Saw a black-tailed deer, the wind being right was enabled to approach the animal to within 20 feet, a beautiful doe. The alpine gentians are now in bloom. Captured a rare butterfly “*Argynnis Eurynome*” female. It is a mountain species. I have never seen it in the valleys. It may be abundant in some parts of Colorado but is rare in this locality. The gentian we saw today is the “*Gentiana barbelata*,” Englm.—alpine species. *August 23* Delivered on the order of the “Inspector General” 50 rifles with their proper equipments and ammunition. These arms were procured from the Governor of Colorado to defend the works during the Indian outbreaks. During these troubles I had 75 men enrolled. The Company was organized as the Granite Falls Guard and I was elected Captain. We had the windows of the blast furnace rolled up and looped for rifles. The place was prepared for defence and shelter, the upper part arranged for the reception of the women and children, the lower for the men. The trails were watched nightly to guard against surprise. Fortunately we escaped the dire calamity of an Indian war. And so the times being now peaceful, the rifles were this day returned to the custody of the State. . . .

August 27 The mining captain sent down word this afternoon that rich ore had this day been struck in the 5th level. We have been expecting it for the last 36 hours. The samples sent down are very fine. “*Tempus omnia revelat.*”

August 28 Visited the Ulay; fine ore from the 5th level. Went to the Golden Wonder ledge in Deadman’s Gulch. It is a wonder in fact. Some of the finest gold quartz I have ever seen, and plenty of it. The ledge was accidentally discovered by Fisher & Benn who were out looking for iron ore. They were resting and happened to break a piece of rock filled with gold in flour.

August 29 Went to the top of 71 mountain. Magnificent view of the surrounding country. Found a very fine ledge of quartz. And after passing over great billowing masses of broken down mountains ground into sand, with here and there immense slides of quartz sinter, we entered into a grand park carpeted with verdant bunch grass and grandly timbered with the sombre spruce. This marked the line of the divide. It was a lovely contrast; on the east arid, desolate and broken; on the west trees, flowers, and meadows; and set upon the very apex was a spring of cool, delicious water. It was here I captured some rare butterflies, the “*Colias Meadii*,” never taken below an elevation of 10,000 feet. *Sept. 11* An Indian scare. Originated in the East park. Originated in a hoax played by some choppers on their comrades. *Sept. 13* The Governor of the State called at the works today. I had no conversation with him. I class these sort of people with skunks, moles, weasels, and other vermin. Political men are an absolute curse to this section. *Sept. 18* Went through the Ulay. Ore from the 4th winze running 40 ounces and $\frac{3}{4}$ oz. gold. Altered the tuyere in the blast furnace.

Sept. 25 Was waited upon by a delegation on the 24th from state com-

mittee informing me that I had been chosen as their representative for state legislature. They urged my acceptance, and guaranteed my election. My instincts would lead me rather to run from the state legislature than to run for it. Firmly and positively declined. Main shaft of engine broke on the night of the 23rd. Got up a new line on the 24th and have it running today, the 25th. Will start blast furnace tomorrow. The damage caused by this worthless shaft is about one thousand dollars. *Sept. 30* Went up Henson Creek to Horseshoe Basin to look at the Mohawk mine. Large crevice 12 feet wide cropping of galena and yellow copper 3 feet. Own half of this mine. Low grade ore looks like Ulay, and about as large. *Oct. 7* Main shaft—blower driver broke again this morning. . . . *Oct. 9* Started stack again. Highway robbers about. Mail robbed 8 miles south of the works. Stage halted by two masked men.

Oct. 10 First heavy snow storm of the season. Cold—mercury at night running from 10 to 15 above zero. (*It snowed until . . .*) *Oct. 14* Cleared off. The ground being warm much of the snow melted. Still we have 18 inches on the level. On the mountains it is from 3 to 4 feet deep. This is called the squaw storm, but it will certainly remain all winter above the valley. *Oct. 18* Our servants have left us. We "men folks" are compelled to be up at 5 o'clock in the morning to make fires and get the freezing air warm in the house. . . . *Oct. 20* Received telegram from New York stating that my presence was necessary there. *Oct. 21* . . . Having left the works on Thursday 5 A.M. have made the journey in 5 days and 7 hours, a very quick trip. Attended to my affairs in New York during the months of Nov. Dec. Jan., Feb., and in March left for Chicago. Put in the machinery and tools for a rolling mill at No. 84, 86 & 88 Franklin St., Chicago, with Corliss Engine of 100 horse power. Started the machinery. Was then relieved by my brother Henry and left for Colorado on Saturday, May 14th, 1881. Arrived at the Smelting Works 5 o'clock. Wednesday afternoon, May 18th.

1881: *May 23* Commenced to overhaul stack furnace and engine with Robert, and put tools in order. *June 6* Furnace running beautifully, have made about 38 tons of bullion during the past week. *June 19* Stack furnace has run to date 2635 bars of lead, about 118 tons. *June 28* Shipped to New York 227½ lbs. of silver and 13½ oz. gold—value about 4000 dollars. *July 4* Very quiet—miners all drunk. *July 5* Shipped to New York 209 lbs. silver and 23 oz. gold—value 3900 dollars. Ran the stack down July 3 to repair engine and get ore roasted ahead for furnace. Commenced stoping on 6th level today (5th).

Sept. Rainy season commenced in August, rain every day up to September with an occasional water spout. Had the experts here from England to examine Ulay & Ute, also J. S. Newberry. All gave very flattering reports of the mines. *Sept. 14* Took Jim Stillman and the two mares—started for the Polar Star mine. Crossed Engineer Mt. at 12 o'clock. noon. An east drift had been started a few days ago on the vein 40 feet above the glacier. When I reached the mine, was greatly astonished at the display of mineral. The richest vein I have ever seen for its size—3 feet of pay streak in 700 to 1000 ounce ore. If it holds, its the finest mine in Colorado. Bismuth silver, brittle silver, proustite or red silver ore in quantity. With proper workings an immense amount of money can be taken from such a lead. I have expended 40,000 dollars on this mountain, and can take it all back as it now looks in as many days. This mine is 13,300 feet above sea level.

Sept. 17 Just received a letter from friend Wood. Says the vein is now 4 feet wide on Polar, and widening with every foot in. Will ship by "Jack Train" 500 ounces per day. We have a train of 40 jacks to pack the ore for 4 miles down the mountain, from thence to the mill in wagons. We have seven such mines on this main range of the Rockies, and I think they are all heelers. The polar anyway is good for 10% earnings on 5 millions of money. We shall see. *Sept. 22* Took Jim, the mare Netty and scott horse. Started for the range. Reached Engineer Mt. at midday. Taking out of the Polar

about 4 tons per day. Fine ore full of ruby silver, vein today 3 feet wide. *Sept. 30* Our dwelling house took fire from the soot in the adobe chimney, and was entirely consumed. Saved most of the clothing and furniture. We are now living in the neighboring shanties. *Oct. 1* Broke ground for the erection of a new dwelling. Wood came in with some magnificent specimens from the Polar Star mine. *Oct. 27* Proof of loss by fire reached New York today. There was an insurance of 1500 dollars on house and 500 on furniture etc. The new dwelling house nearly completed. Now running the west drift on Polar. The trail closed by snow some time ago. We took from the east cut, which was simply a drift about the size of an ordinary front door, six thousand six hundred ounces of silver in a few days. The elevation being so great that the men could not work on account of the excessive cold. The ore sent down was not sorted, but simply shovelled into sacks, vein matter, mineral and country rock. The best record of production I have ever heard of in any silver mine in this section. Will push work vigorously this winter, and expect by Spring to get out some hundreds of thousands of dollars worth of ore. *Nov.* Was telegraphed to start for New York to attend to the matter of sale of mining property to English parties.

1882: *March 14* Returned to Colorado. Came by way of Charleston, Augusta, Atlanta, Cincinnati, etc. *May 1* Received telegram from New York that the C.M. & S. Co. had been taken by the English parties. *May 1* Started for Engineer Mt. Reached roses cabin with horses 9 o'clock. A.M. Left for mountain on foot. Travelled through snow for 3 miles, 3 feet deep and reached the Polar Star mine 1½ o'clock P.M. Every peak covered with snow. Polar in fine ore—Blk silver in fine ore. Putting down shaft in placer this side of mountain. Looks like a second Leadville. Have no doubt but that great stores of mineral in a placerform shape will be found., on the "American Flats." Have two claims there 3000 x 300 feet "Inferior and Sarah Wood"—Took cold from this hard journey and am suffering dreadfully from the effects of the exposures.

BOOK REVIEW

Landscape into Cityscape by Albert Fein. Cornell University Press, 1968. \$12.50.

Professor Fein's collection of twelve documents from Frederick Law Olmsted's architectural career, nine of which are reports presented to various boards or commissions, shows Olmsted's approach to a wide range of projects in New York. This collection is of great value in understanding the rationale of his plans.

Olmsted was an artist for whom esthetically satisfying arrangement of landscape was a medium for the promotion of healthy and democratically committed cities, and none of his projects was conceived of as an entity divorced from the surrounding community or as a work to be admired in a final perfected form. For Olmsted the form of the city was to be defined by the varied needs of man—the commercial, domestic, transportation, health, recreational and spiritual needs of modern man in his intensely demanding, exhausting, exhilarating and satisfying world. As these documents show, his aspirations were not limited to developing parks to replenish the spirit, but extended to planning an environment for the

entire area of Greater New York that would enable its citizens to find satisfying conditions in which to work out their own commercial and private lives.

The idea of community and the benefits of neighborly concern impressed on him from his childhood were paramount in Olmsted's thought. Thoroughly realistic and, in fact, acutely perceptive in regard to demographic trends, Olmsted saw the weakness and decline of rural society at the same time he regretted the passing of village ways. What the agricultural heritage of the nation had produced was the flowering of his native New England and the thrust of the frontier; what it had also produced was a brutalizing slave society in the South. The transportation revolution symbolized by the Union Pacific Railroad, and the explosive growth of industrial production were bringing farms and small towns out of their isolation, closer to each other and to the big cities in terms of desires and experiences. The manufactured artifacts of city life were available to farmer and townsman, the experience of city life was not farther away than the railroad, the excitement and opportunity of the city appealed to the proverbial bright rural lad, with the result that rural society was actually drying up. Convinced, then, by both his ideals and his observations that the future of America as a democratic nation lay in the proper development of her cities, Olmsted set about leading her greatest city, New York, toward a condition of efficiency and amenity.

With the growth of New York, and other cities, the problem was how to direct growth so the city could benefit from the best aspects of country life, which Olmsted believed were the healthful attributes of fresh air, space, and trees, and the socially desirable community feeling that derives from stable relationships in a harmonious environment. Size of population itself was not a crucial factor in developing a fine city, but distribution of the population into densities appropriate for its various activities was essential. As the city grew, so did its resources and opportunities, but variety of experience was as important as quantity. The grid pattern of streets, for instance, that was established in 1807 and which determined the laying out of each new neighborhood and commercial district as the population continued its expansion northward in Manhattan, was anathema to Olmsted. The advantages of knowing ahead of time the exact dimensions of each block and building-lot were outweighed by the disadvantage of forcing every function of a street and block into predetermined and unchangeable sizes and shapes. The absurdity of forcing a family that wanted to live quietly in its own home surrounded by a small garden and in the vicinity of a major public institution like a museum or concert hall to adapt its

needs to the same grid was as obvious to him as was the neglect of topographical considerations implicit in the pattern. His discussions of road patterns for Riverdale and Staten Island—neither of which had yet been incorporated into the City and subjected to right-angle abuse—show thorough study of topographical conditions and, most importantly, of the purposes to be served by the projected roads in terms of the over-all needs of the region.

Even though there was still plenty of open space within Manhattan and the adjacent counties, the movement to farther residential areas in Westchester, New Jersey, and Long Island was well underway by the time Olmsted presented his Scheme of Improvement to the Staten Island Improvement Commission in 1871. Staten Island in the post-war era was in the peculiar position of not benefiting from the suburban real estate boom that had begun in the '40's and '50's. In fact, real estate values on the island were declining and Olmsted, with a characteristically thorough and broad-gauged analysis, explained to the distinguished commissioners why this was so and what steps they should take to reverse the situation. (See *Proceedings* v. 22:3 and v. 23:1.)

According to Olmsted's analysis of urban history the division between commercial and domestic areas within cities would continue and, according to his own social theory, the division should be encouraged. New York Island was suited mainly for commerce and would be built up to a high density with roadways designed to carry the products of manufacture and commerce. The domestic requirements of fresh air, space and greenery, combined with convenience would be most suitably located in Brooklyn—"New York outside the walls." The over-all plan for Brooklyn, including Prospect Park, involved connections across the East River to make the two boroughs part of an integrated metropolis, for Olmsted's concept of suburb was of contrast within the city rather than divorce from it.

Olmsted saw the threat of mental and emotional strain as a hazard of city living as serious as physical ailments. An expanding city pushed the boundaries of the countryside farther and farther from its residential neighborhoods and therefore provision had to be made within the city for "sunlight and such forms of gentle exercise as are calculated to equalize the circulation and relieve the brain." Prospect Park was the project designed to provide the "tranquilizing recreation . . . essential to health and strength," and the components of tranquility Olmsted named show an attitude toward man's emotional needs that was shaped by compassion and the memory of the New England countryside. The park was to be designed primarily to create a "sense of enlarged freedom," and then

a "diversion of imagination" with scenery offering as great as possible contrast to the rest of the town and an opportunity for many people to gather together outside of their usual neighborhoods solely for enjoyment. In an ideal situation the approaches to a park would be designed to extend the pleasure of the park throughout the town, and Olmsted planned parkways as axes of residential areas as delightful to passers-by as to their residents.

Many of Olmsted's plans cater to the needs of wealthy and influential citizens who require a certain degree of luxury and refinement in their surroundings to keep them from drifting off to the outer suburbs (in the usual meaning), for he realized long before the flight of the middle-class impinged on the consciousness of the city fathers that a prosperous and civilized community has to be a socially balanced community. Yet one of the most appealing aspects of his plans is his concern for all classes of people and his conviction that the city government is responsible for providing as public amenities facilities that in the country were only private privileges. His concern that the working class not be lost "in this shadow of egotism" (of "men of literary or clerical habits"), is particularly evident in his recommendation of 1879 that in developing Rockaway Point as a resort "your best policy is to provide directly, frankly, ostensibly and with manifest pride . . . for the accommodation and gratification of this class . . . the great, industrious, moderately-thriving, decent, self-respecting class, the children of which mainly fill the common schools."

The value of having these documents collected in a single volume depends largely on how they are used. The specialist or professional will no doubt find it an extremely useful resource work, but too great an editorial burden has been placed on the general reader who could be the one to benefit most from exposure to Olmsted's ideas. For all readers, the obvious response to Olmsted's writing a century ago on issues as yet unresolved or laying out plans for suburbs irretrievably lost in the asphalt canyons is to conclude that in matters of public policy we learn too slowly. While there is always the lurking danger of treating these documents as gospel and using them to answer questions rather than ask them, the timeless quality of his graceful and humane approach to creating a viable and pleasant city should affect the thinking of any reader concerned with tomorrow's environment.

—Elizabeth Saxe

ABOUT OUR CONTRIBUTORS

Lorraine Elise Williams, a native of Rahway, New Jersey, has her B.A. from Douglass College (New Jersey) and her M.A. from New York University in Anthropology. During her post-graduate years, she first held a Graduate Assistantship in Archaeology at N.Y.U., and later an N.Y.U. Pre-Doctoral Fellowship. She has received a Pre-Doctoral Internship for 1968-1969 from the Smithsonian Institution. Her field experience has been extensive: on the Northeast coast, in Arizona, and in Turkey. She is a member of the American Association for the Advancement of Science and of the Society for American Archaeology.

John Cole, a native of Lincoln, Nebraska, graduated from Columbia University in January 1968. He is continuing his studies in anthropology and archaeology at the University of Illinois (Urbana), where he held an instructorship this past spring. He had had two years' experience in the field as part of a federally-sponsored salvage program for areas in Iowa which were eventually to be inundated as reservoirs. While at Columbia University, he worked as an Urban Corps intern for the Staten Island Institute of Arts and Sciences setting up the catalogue system for the Archaeological Collection and cleaning, sorting, and identifying the artifacts in the Staten Island portion of it. His article now forms the basis for the continuation of the cataloguing of this Collection.

Nancy Deckinger, whose home is in Queens County, is a Junior at Bard College, Annandale-on-the-Hudson, N. Y. A history major, during her field period, she spent six weeks putting in order, reading, abstracting, and correlating the information available in the Crooke Family records preserved by the Institute. She worked at this project as an Urban Corps intern during January and February 1968. She submitted the article included in this issue as a summary of her work.

John J. Crooke, about whom much appears in this issue of the PROCEEDINGS, lived until his death in 1911 in the Crooke Estate which included the area now known as Great Kills Marine Park, which was then known as "Crooke's Point."

Elizabeth Saxe (Mrs. John Saxe), now lives on Staten Island and works as an Assistant in the Institute's Library in charge of the cataloguing and preservation of prints and maps held by the Institute. This work is being performed under the current New York State Council for the Arts grant awarded the Institute. In college her major was history, and her interests include an increasing knowledge and appreciation of all the facets of urban planning, past and present.

PROCEEDINGS

Staten Island Institute of Arts and Sciences



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A Petrological Study of Aboriginal Projectile Points from Staten Island

*Contribution Number 3 of the Metropolitan
Area Archaeological Survey*

by EDWARD S. RUTSCH

INTRODUCTION

The 528 projectile points attributed to Staten Island under consideration in this study are part of the research collections of the Museum of the American Indian in New York City. This aggregation of aboriginal material is the result of 50 years of serious and desultory excavation by the museum and an equal period of ingesting collections of projectile points from other sources. The author compiled these data while employed by the Museum of the American Indian as curator of the research collections.

PETROLOGY

The points were first divided into material of composition. Table 1 shows the resulting data. A brief discussion of the materials follows:

Cryptocrystalline Quartz

Quartz. Quartz has three properties that make its identification easy: very hard, it will scratch glass but cannot be scratched by steel; it fractures conchoidally; it fractures without cleavage.

Quartzite. This cryptocrystalline quartz is formed metamorphically from quartz as it recrystallizes. Its similarity to sandstone often makes for difficult identification; however, quartzite fractures across the grain and sandstone along the grain.

Chert. Local archaeological terminology usually identifies the numerous varieties of chert by color, a scheme that will serve

TABLE 1. Petrology

Material			No./Points
Cryptocrystalline Quartz	Quartz	Quartz	29
		Quartzite	10
	Chert	Black	68
		Gray	157
		Green	7
		Creamy	14
		Jasper	159
		Chalcedony	4
Igneous		Felsite	117
		Granite Diabase	60
Sedimentary		Argillite	185
		Red Shale	10
		Gray Shale	
		Red Sandstone	8
TOTAL..			828

until such time as further study gives us a surer descriptive tool. Cherts have no cleavage, fracture conchoidally, and cannot be scratched by steel. Specimens in this study were black, gray, green, and creamy; jasper ranged from red to brown and chalcedony was a translucent milky color (Tarr 1936; Richards 1941B:19).

Igneous

Felsite. Often termed rhyolite, felsite is a hard igneous rock available to aborigines of this area.

Granite Diabase. Often termed trap rock, granite diabase is a hard igneous rock available locally for projectile points.

Sedimentary

Argillite. Much like shale, argillite has been pressed into a denser form producing a sharp-edged fracture. Although tools of this material are better and last longer than shale tools, time often

weathers argillite to a laminated appearance with a chalky surface.

Shale. Shales are formed from fine-particled sediments, such as mud or clay. They tend to fracture along the layers into which they have been pressed. Although fracturing produces very sharp edges, the material is not durable and dulls quickly.

Sandstone. Sandstone is made of pressed sand particles. It is occasionally used for chipped tools, such as projectile points (Richards 1941B:21; Richards 1941A:5).

DISCUSSION OF SOURCES

The problems I posed during this study asked about the nature and sources of the materials used in stone projectile points of Staten Island. The sources of these previously listed materials themselves present several interesting questions. How did the non-local material come to be found in the stone tools of Staten Island? Did the Indians use different varieties of stone over a long period of time?

Table 2 shows the petrological materials exotic to Staten Island, their probable sources, and the possible routes or methods by which they were transported to Staten Island. Materials local to Staten Island do not appear in Table 2; they were probably found in local outcroppings or as glacial till. Local materials are as follows: quartz, quartzite, granite diabase, shale, sandstone, and jasper*.

Of the 828 projectile points considered in this study, 711 were of materials that could have been exotic to Staten Island. In the case of the 302 points made of felsite and argillite, which are not generally found in glacial till moved from the North and are not found in local outcroppings on the Island, we have a fairly clear case of trade or travel toward the West. This hypothesis of trade or travel for projectile point material toward the West, and perhaps toward the North in the case of the cherts and chalcedony, is backed by ethnographical accounts of Indian movements during contact times. For example, movement across New Jersey between the Delaware Valley and coastal New Jersey and Staten Island was common and perhaps seasonal (Newcomb 1956).

I then set out to determine whether Indians used the same materials for their points throughout prehistoric time. To accomplish this end, I separated all the points into recognized types and

*During preparation of this report geologists and the editor of this journal pointed out that jasper was found on Staten Island. See Bibliography. Analysis of this material and a comparison with jasper from the west is under way and will be reported on in a future issue. — E. S. R.

TABLE 2. Sources of Petrological Materials Exotic to Staten Island

Material	Possible Sources	Method of Movement
Black chert	North	1. As stones, carried from the North by glacial movement
Gray chert		
Green chert		2. Carried in by humans who traveled to the sources or who traded with peoples toward the North.
Creamy chert		
Chalcedony		
Felsite	West	1. Trade.
Argillite		2. Travel.

separated these types into two time periods—Pre-Woodland and Woodland. I adhered fairly closely to Ritchie's work on point typologies (Ritchie 1961). The Pre-Woodland Period includes all cultures previous to the Woodland era, a span covering the Archaic and Paleo Periods. The Woodland Period, the more recent, began approximately from 1500 to 500 B.C., when local Indians first made pottery, lived in more permanent villages, and practiced agriculture. The era ended with European contact.

One exception I made to Ritchie's grouping was the Steubenville point, which I placed in the Woodland Period owing to more recent data collected in the coastal New York area (Kaeser, personal communication).

Table 3 shows the point types listed by time period. Table 4 gives the breakdown of the number of points of each material per time period; per cents are also given. Figure 1 gives the data of Table 4 in graph form for easy comparison.

Apparently the people of the two periods made significantly different choices of materials for their projectile points. Generally, the later Woodland people used more cherts and jasper, exotic materials that perhaps reflect a time of increased trade and travel—for example, quartz, a local material, was used less in the Woodland Period than in the Pre-Woodland. One exception is argillite, which, although also originating in western New Jersey sources, was used a great deal more in the earlier Pre-Woodland Period.

TABLE 3. Point Types Listed by Time Periods

Woodland	Pre-Woodland
Adena	Bare Island
Jack's Reef Corner Notched	Brewerton Corner Notched
Jack's Reef Pentagonal	Brewerton Ear Notched
Levanna	Brewerton Side Notched
Madison	Clovis
Meadowood	Lamoka
Steubenville Lanceolate	Normanskill
Steubenville Stemmed	Orient Fishtail

CONCLUSIONS

My general conclusion from these data is that the many types of materials used for projectile points and the distances that the Staten Island aborigines were from their sources indicate the great effort that they must have made to obtain the most suitable materials. Trade or travel was always a factor in aboriginal life.

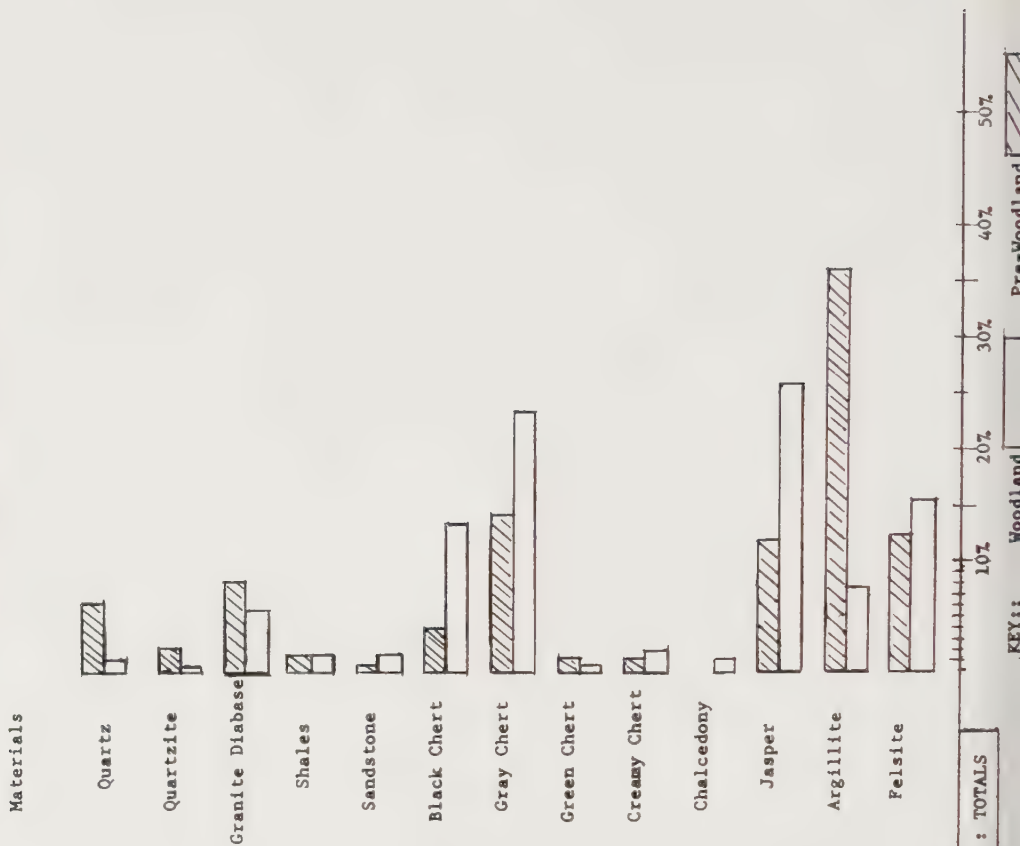
It would appear that a shift to chert evolved from the Pre-Woodland to the Woodland Periods, and that for projectile points, it was probably the most desired and the best material. This increased use of the desired but exotic material reflects the Indian's growing surpluses of food, which allowed him to spend time traveling. Perhaps they also gave him something to trade to peoples who controlled chert sources or who may have been developing a specialty in point material trade.

(Table 4 and Figure 1 follow on page 80.)

TABLE 4. Numbers and Per Cents of Points of Given Materials According to Time Periods.

Pre-Woodland		Woodland	
No./Points	%	No./Points	%
26	6.1	3	.7
9	2.1	1	.2
35	8.3	25	6.2
5	1.2	5	1.2
2	.5	6	1.5
17	4.1	51	12.6
62	14.6	95	23.5
5	1.2	2	.5
6	1.4	8	2.0
0	0	4	1.0
51	12.0	108	26.7
154	36.3	31	7.7
52	12.3	65	16.1
424	100.0	404	100.0

FIGURE 1. Breakdown of Points of a Given Material by Periods, in Per Cents.



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The Severe Storm of

July 24, 1968

by KENNETH E. COLE

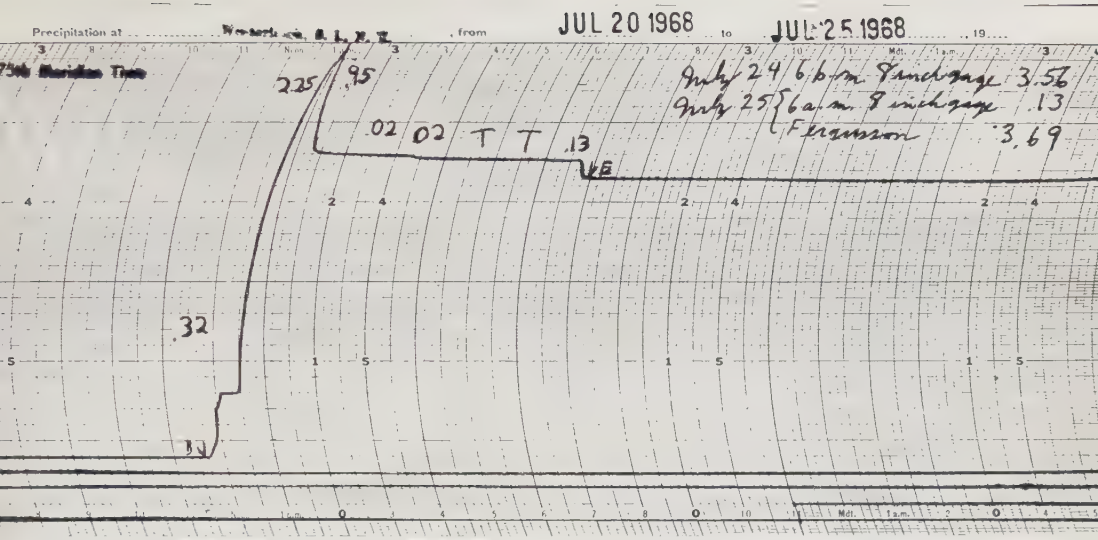
As a weatherman, I have noticed that there is a popular lack of understanding of the nomenclature of storms.

A hurricane always forms in the tropics, and if it takes the proper direction, it can eventually affect this area. A hurricane is one of the most powerful of storms because it covers several hundred miles of territory most of the time.

Along the coast here we often get severe winter storms, generally with a northeast, sometimes with a southeast wind. These form over the southern states, pulling out moist warm air from the Gulf of Mexico, and as they travel up the coast they can do extensive damage, sometimes even more severe than that caused by hurricanes, such as the storm of March 1962 did. These storms often generate a wind velocity of above 75 miles an hour. On the Beaufort scale wind in excess of 75 miles an hour is called "hurricane force" winds. This is probably the reason many people have the idea any storm producing extremely strong winds is a hurricane.

The storm which caused flooding and other damage to Staten Island late in July 1968 was an extremely severe thunder storm. A severe thunder storm is usually a very local storm and is also accompanied by extremely strong winds. It is a characteristic of thunder storms to build up fast and strong in a small area. This summer seems to have produced a number of intense local storms of this type in this area: Allentown, Pennsylvania, and the surrounding area had an extremely intense one on July 18, and the first week of August several other locally severe storms were logged in the same vicinity. The severity of a thunder storm depends upon several conditions, one of which is the local breeding conditions, that is: a warm sultry day with many rising air currents.

If the storm comes up very suddenly and continues in one direction for a while, it is often referred to as a "line squall." This can produce extremely strong wind velocities which can do much



Time used on this chart is 75th Meridian Time. To convert to Daylight Saving Time, add one hour. Reproduction of chart from the Fergusson Weighing Gage at the Westerleigh Weather Station. (Courtesy of Kenneth E. Cole)

damage. Another characteristic of a line squall is the sharp line of wind direction change as the line moves through. This can rip apart many things as the shear line moves through.

The tornado is the severest type of thunder storm which for its size is nature's most powerful storm. A tornado is always marked by a funnel of rapidly spinning air which is responsible for the destruction. This kind of storm generally creates total destruction in the path of the funnel. The rotating air scatters debris in all directions whereas a line squall will generally blow things down in one direction unless buildings or other objects deflect the wind. Also a line squall generally does not create total destruction unless the wind velocity is extremely strong or the object weak.

The weather station at Westerleigh is located approximately two miles in from the Kill von Kull and about three miles east of the Goethals Bridge. Over the years we have noticed that thunder storms seem to follow the Kill von Kull and pass to the north of us or track south of us over the Raritan Bay. This route often puts the severest part of the storm to the side of the weather station.

We have often observed that the storms seem to increase in intensity to the east of us as they reach the bay. This could help to account for the severe effects of the July storm on the South Shore as it seems to have built up and then spent its fury on the Island before moving out across the bay.

From the reports I have received, this seems to have been an

extremely severe local storm, which is a common characteristic of thunder storms. Another characteristic is that the wind is always strongest near the center of the storm.

According to the chart produced on this station's Fergusson Gage, two inches of rain fell within one-half hour which is, I believe, a record for this station. As you will note on the chart reproduced here, the Westerleigh station logged 3.69 inches of precipitation, leading me to believe that the worst action of the storm occurred south and east of the station. The *Staten Island Advance* reported a rainfall of four and one-half inches.

DESCRIPTION OF THE STORM

A severe storm accompanied by high winds, heavy rain, thunder and lightning struck Staten Island on Wednesday, July 24, 1968. No similar storm effects were felt in neighboring areas of New Jersey, or over Manhattan or Long Island. These locations received only marginal rain or none at all.

Heavy rain began to fall after noon of that day accompanied by wind. A wind gauge at Mansion Marina, Great Kills, registered steady wind from 2 P.M. to 2:30 P.M. of 60 miles per hour with gusts to 75 miles per hour. Rain was reported by the *Advance* to total 4.55 inches for the day on the South Shore. Rain tapered off towards evening.

The general situation that afternoon had consequences which in some cases were felt from two to five days later. Many sewers backed up during the height of the storm, even flooding Watchogue Road near Four Corners (approximate elevation: 260 feet), and stopping or re-routing all traffic for several hours in the vicinity of flooded areas. Thousands of basements, street intersections, and roads under overpasses were flooded. Twenty separate underground telephone cables were put out of commission by water seepage, cutting off over 5,000 telephones. High winds knocked down trees and branches as well as power lines which in one instance left 840 customers without power for two hours in the Oakwood area. The torrential downpour caused a major landslide on the Staten Island Expressway.

Many phones were still out, several days after the storm. The landslide on the Expressway left the embankment in a highly dangerous situation which was not repaired for a longer time. Motors which burned out during the storm, probably because the force of the wind turned fans and/or rotors in the reverse direction at high speed as in the case of window air conditioners and the pollen sampler on the roof of the Institute for Basic Research in Mental Retardation, took longer to repair. Other losses, such as

the uprooted 45-foot-tall tree in Mariner's Harbor will never be replaced. It is now a part of the records of the Park and the Highways Departments.

The storm also endangered wildlife as well as humans. A raccoon was reported saved after it had been caught in a sewer grating, as were two cats, screaming and swimming for their lives in a flooded basement. Happily no loss of life, either to humans or wildlife, was reported.

Mud, rocks, gravel, branches, leaves, and other debris clogged sewers and layers of silt covered roadways for several days afterwards. We have not read any assessment of the total amount in dollars of the damage but we would guess it to be greater than the \$1,000,000 damage which the "Great Rain" of September 1926, did to the Island. That storm was responsible for the death of a woman; the SIRT was out of service for two days from Great Kills to Tottenville; two dams were broken, one in the Clove Valley and the other at Wolfe's Pond.

The history of storms which have passed over and affected the Island includes a total of 239 storms characterized by the Corps of Engineers as "hurricane, tropical, or extra-tropical." These are rated from moderately-severe (98 storms) to unusually severe (7 storms). One tornado, occurring in 1835, has been recorded to have affected Staten Island. The destruction caused by this year's storm and the high rate of winds evidently contributed to the varying descriptions used by the average citizen: hurricane-like or tornado.

In summary, the worst of the storm was evidently felt by the communities on the South Shore. The total rainfall registered differed by almost one inch between that reported on the South Shore (4.55 inches) and the report from the west side of the Island's ridge (3.69 inches). The wind on the South Shore was worse as indicated by the effects on that area compared with the lesser effects at the Westerleigh station where corn stalks which Mr. Cole had planted were still standing after the storm. Corn is easily flattened by heavy wind. Mr. Cole points out that during one-half hour 2 inches of rain fell which he thinks may be a record. Roughly coincidental in time is the report of the steady 60 MPH wind clocked on the South Shore.

Added to the damage caused by winds and heavy rain was that caused by massive run-off and erosion from the heights to the low-lying areas. The major part of such damage is due more to poor development practices and planning than to vagaries in weather. When trees, top soil, and bushes are stripped from the heights and replaced by non-absorbent buildings and road surfaces, rain imme-

diately runs off down the slopes carrying with it whatever is loose or can be loosened. In nature, the leaves of trees and bushes tend to break the impact of rain drops, the litter of forest floors tends to absorb the water. These practices are well known among conservationists, progressive farmers, forestry managers, but evidently our building trades and contractors could do with a short course in man's relation to nature.

So as more trees and bushes are removed from the high ridges, as more tar and concrete is poured, more and more flooding can be expected even if the rain is only an ordinary one. And if the topography continues to be drastically changed, we will see a new picture in weather. Such a storm with such results makes us wonder how much we are already responsible for the weather in which we live? And as changes continue, what kind of weather will we have next year?

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Three Boys Afield

On Staten Island

by HOWARD H. CLEAVES

*'T is education forms the common mind:
Just as the twig is bent the tree's inclined.*

—Essay on Man, Alexander Pope (1688-1744)

The following reminiscences by Mr. Cleaves are in part a tribute to his companions of early years on Staten Island: James Paul Chapin (1889-1964) and Alanson Buck Skinner (1886-1925), as well as to their "mentor," William Thompson Davis. The experiences and training they acquired during their youthful years are not so easily captured by youngsters today: the miles of open woods and fields have been diminished; the opportunities for uncritical investigation, consideration, and learning are no longer obvious. But in some ways this activity can still be indulged as long as open spaces like the Davis Refuge and High Rock are protected and efforts to save other natural areas achieve success. protected.

G.K.S.

The Cleaves family arrived on Staten Island from Aurora, Illinois, via Philadelphia and Brooklyn, in late autumn 1901. We spent but a few months in both Brooklyn and Philly where I was most unhappy so great was the transition from life in the prairie country of Illinois where we could hear prairie chickens on their booming grounds from our house on Pearl Street. I had lived there for seven of the first thirteen years of my life. Boys in those years collected neither stamps nor autographs. They collected birds' eggs. At age 13, my collection contained eggs representing about 35 different species. These treasures survived the big move from the mid-west but most were broken in the shorter jump to Brooklyn.

Our peregrinations were caused by the migratory movements of my father. He was a tool maker and machinist—his specialty.

watchmaking—and went where the work was. It was a happy event in my career when father became employed by the S. S. White Dental Manufacturing Company at Prince's Bay and we moved from Brooklyn to Staten Island. Our abode was the western half of a double house on what is now Purdy Street—the first house east of the old inn, now called Flo's Tavern, at 507 Seguin Avenue. Our rent was \$7 a month and life was primitive. Water for drinking and cooking was drawn by bucket from a well; bath water (baths once a week in a galvanized iron tub) and water for laundry was caught on the roof and drawn from a cistern by turning a handle which operated an endless chain with rubber discs at intervals, the water being raised in a column up a wooden tube and discharged into a pail or other receptacle. Cooking was done on a kitchen stove with anthracite or hard coal as fuel, the price being about \$5.50 per half-ton. We had no electricity; ate our evening meals and read by the light from kerosene lamps. The facilities were outdoors in the back yard at a distance of at least twenty-five paces from the house. After dark a kerosene lantern was carried to find the way.

If living conditions were crude, there were compensations aplenty for a boy with a craving for open country to explore. Wolfe's Pond and much wild woodland were less than half a mile away. In those woods grew many chestnut trees yielding their annual crop of the coveted nuts enclosed in spiny burrs. (There was no inkling that this wonderful tree would a few years later be wiped out completely by the chestnut blight.) Raritan Bay and Prince's Bay were each marked by a forest of oyster stakes indicating the location and boundaries of oyster beds owned by local oystermen many of whom belonged to the Prince's Bay Oyster Company.

I attended Public School 3 in Pleasant Plains about a mile and a half or two miles from our new home, a distance which was walked both ways daily, there being no bus transportation in those times. I graduated from P.S. 3 in June 1903 and still have the diploma signed with meticulous penmanship by Gould J. Jennings, Principal. High school was started in the fall of 1903 at Stapleton, but we were soon transferred to Curtis High School in St. George when that building was nearing completion. I had not been long at Curtis when I met James (Jim or Chippy) Chapin and his good friend Alanson (Allah) Skinner. These two soon made me acquainted with William T. Davis, Staten Island's outstanding but modest naturalist, historian, essayist, and much-loved gentle philosopher. We three boys became known as Mr. Davis' proteges.



William T. Davis and Alanson Skinner at Oakwood Heights probably on October 12, 1909, which was Mr. Davis' 47th birthday. (Photograph by Howard Cleaves. Contact print by Larence Shustak from original glass negative. Cleaves Collection, Library of the Institute.)

he our mentor. Chapin once said: "Mr. Davis taught us how to observe."

The four of us made many field trips together to many parts of the Island—the Oakwood-Great Kills salt meadows and beach, Crooke's Point, Wolfe's Pond and adjacent woodlands, Prince's Bay and the Mount Loretto area. It became almost a ritual each early spring from about 1905 to visit the barred owl nest tree a short distance south of P.S. 8 in Great Kills. An old lane beside a stone wall led into a fine woodland where grew a large pin oak featured by a big cavity in its trunk about twenty feet above the ground. In this hole the owls made their nest. We approached the tree stealthily and when all was ready one member of our party struck the base of the oak with a stout club and out would fly the old owl. I took a number of photographs on these occasions and was understandably proud when the great Dr. Frank M. Chapman, head of the bird department at the American Museum of Natural History and editor of *Bird-Lore* magazine, published a selection of these

pictures. Once when we visited the owl tree, Chapin climbed to the nest, removed a young barred owl from the cavity and held it in his lap while I took a photo from the ground below. One year our owl tree party was joined by Mr. Herbert Lang of the American Museum, the man with whom Chapin was to spend five years in Africa on a scientific expedition, collecting specimens for the Museum.

Chapin and Skinner knew several places on the Island where they could be sure of getting something to eat. The two most dependable of these were the Cleaves home in Prince's Bay and the Wort farm in Rossville. The Wort family was so large it might almost have been termed a tribe. There were eight children: six boys, two girls. The eldest was Ed, then followed George, Anna, John, Henry, Arthur, Grace, and Harold. Imagine the spectacle when these plus Papa Isaac Wort and maybe four or five guests marched into the Wort dining room for dinner. A combination of two tables, end to end, ran nearly the length of the room with barely space for Mother Wort and Anna to squeeze through as they brought platter after platter heaped with chicken, potatoes, and corn-on-the-cob from the kitchen.

We did a lot of exploring in Rossville and around the Fresh Kills, Skinner always on the alert for Indian artifacts, Mr. Davis equipped for insect-collecting but interested in everything, Chapin and I rather partial to the bird life. The older Wort boys, and occasionally Father Isaac Wort, joined us on these rambles. One locality we were attracted to was Lake's Island, now a city garbage dump, reached by taking Muldoon Avenue from Arthur Kill Road. Thoreau was said to have visited this place when he was on Staten Island. It was here that we were able to capture least shrews by turning over large sheets of tar paper that were scattered about. Skinner conceived the practice of catching box turtles, carving the year on the under shell or plastron, then letting the creature go. When we were scouting the woodlands near Rossville one of the Wort boys stooped to pick up a tortoise, which promptly flew away! It was a woodcock sitting on her nest.

Chapin early acquired the habit of collecting specimens in the true scientific tradition. In a letter written me on January 30, 1968, by John Bull who is working on material for a new book on the birds of New York State, he writes: "In going through the egg collection in the American Museum for New York State records. I came across the following from Staten Island which will interest you: Three eggs of the Least Flycatcher taken at Egbertville on June 17th, 1905, by Jim Chapin. The nest was found ten feet up in the crotch of a small tree. As far as I know Chapin did not



James Paul Chapin holding young Barred Owl which he took from the nest cavity in a large oak in Great Kills (about 1909). (Photograph by Howard Cleaves.)

publish this discovery, and I believe that this is the only definite breeding record of the Least Flycatcher on Staten Island."

In quest of the Rough-winged Swallow, reputed to associate with the Bank Swallow, Chapin and I once went on a little excursion off the Island. We had learned of a colony of Bank Swallows at Laurence Harbor, near the outlet of Cheesequake Creek, directly across Raritan Bay from Prince's Bay, in New Jersey. We crossed the bay by rowboat from Prince's Bay, taking with us a minimum of equipment for camping out overnight. We had no tent but only a square of tarpaulin which we rigged as a shelter against the steep bank at the head of the beach. Rain during the night started a mud slide which oozed down the steep bank into our sleeping

quarters under the canvas. When one is young and hardy, such adventures are taken with a light heart. The results of this expedition were wholly negative: we failed to find any Rough-winged Swallows. Years later this species nested regularly on Staten Island, a single pair in an old kingfisher hole in a cut bank along the waterfront in Wolfe's Pond Park; and usually two pairs, as recently as 1966, in drain pipes under the bridge over Lemon Creek on Hylan Boulevard, Prince's Bay.

On another occasion I rowed with Chapin just off-shore all the way from Prince's Bay to Great Kills. It was winter and when we came to the peat banks near Crooke's Point, Chapin "collected"—meaning shot—a Purple Sandpiper for his collection. This hardy shorebird which comes to Staten Island from the North only in winter can be seen even today at Great Kills, sometimes in considerable numbers. Chapin built up quite a nucleus of bird specimens which he took on Staten Island, having schooled himself in the long-established museum tradition that serious scientific work is inevitably based on specimens accurately identified, properly labeled with needed information such as locality, date, name of the collector. Equally important is the proper cataloguing, preservation, and storing of the specimens collected.

Charles H. Rogers of Princeton, New Jersey, tells of having been afield with Chapin and others. A small bird of uncertain identity was observed near the margin of a marshy area. Chapin shot the bird, which fell into the tall grass. The group went forward to retrieve the specimen but could not find it. Perhaps the bird was only stunned and had escaped? The spot was combed thoroughly and just as the party was about to give up the dead bird was discovered. One of the searchers may have stepped on the bird and pressed it deep into the mud. Chapin carefully extracted the bedraggled trophy, painstakingly cleaned and skinned it, transforming it into an immaculate scientific study skin for his collection.

All of this local collecting gave the young Chapin much invaluable background experience for his life work which was to be ornithology, in particular the study of bird life of Africa, especially that of the Belgian Congo, for the American Museum of Natural History in New York City. The Lang-Chapin African expedition (1909-1914) must have set a record for the number and importance of the specimens secured, as well as for the meticulous care with which all of the material was prepared, labeled, and transported from Africa to the United States. In museum circles, a well-made bird specimen became known as a "Chapinish skin." Chapin would probably smile at the remembrance of one of his experiences in the years before Africa. Word spread that Chapin was in trouble. He



Howard Cleaves, as a young man, holding a rabbit at Prince's Bay, Staten Island (about 1904). (Photograph by Frank Schultz. Contact print by Larence Shustak from original glass negative. Cleaves Collection, Library of the Institute.)

was reported to have been apprehended by Conservation Officer game warden—Edgar Hicks. There was much secrecy about it and nobody seemed able to learn anything. Had Chapin been shooting protected birds on Staten Island without a permit? If he had had a permit, perhaps he had failed to renew it! Was he also accused of discharging firearms within city limits contrary to an ordinance? This would be a police matter, however, and no concern of a game warden. The matter was finally adjusted and it was speculated that Mr. Davis had something to do with it. Perhaps he used persuasion; or he may have paid Jim's fine. Nobody ever learned.

The specimens of Chapin's from Staten Island are now a part of the vast collection in the American Museum of Natural History and will serve the needs of researchers and writers in the years that lie ahead.

February, 1968

BOOK REVIEW

Ancient Environments by Léo F. Laporte. Prentice-Hall, Inc. 1968.
\$2.00 (Paper), \$5.95 (Cloth).

"Ancient Environments" by Professor Léo F. Laporte is one of a new series, Foundations of Earth Sciences, and is a concise, well documented book, using many graphs and fine illustrations to underline the text. Its subject is Paleoecology, an ecology projected backward in time. It gives a clear insight into the environmental factors of ancient habitats such as temperature, salinity, and humidity, and while explaining that many other factors are not recorded in existing sedimentary rocks, tells us that in this particular branch of science, inference and the development of special techniques must play a decisive role in interpreting the past. After reviewing the geologic environment, Dr. Laporte goes into detail on the origin of the sediments, discussing the genesis of grains, their transportation and deposition, and their final transformation into lithified rock (diagenesis).

He demonstrates that organisms can re-work sediments to such an extent that their original structures and textures become completely changed and a close examination of stratigraphic relations may disclose the nature and succession of these particular surroundings.

In arguing the various forms of adaptation to the environment and the individual "niches," this keen observer of ancient creatures and their surroundings puts great emphasis on adaptive morphology, paying special attention to structural relations of the fossilized skeletal parts for inference to be made about habitats.

The reader is fascinated by his brilliant account of the great potential of living things for affecting sedimentation and their ultimate breakdown into thousands of calcite prisms and aragonite needles; he convinces us that the relatively unstable aragonite forms of CaCO_3 presupposed a warmer marine climate mainly associated with the Cretaceous era.

Startling is his tale of a rather recent result in geochemistry: the extraction and recognition of organic molecules presumably of biologic origin from rocks three billion years old; the presence in these otherwise non-fossiliferous rocks of organic compounds such as phytane and pristane, decaying substances of chlorophyll (known in the vernacular as "chemical fossils"), thus presuming

the appropriate condition for formation of carbohydrates and therefore the great probability of plant life. This would *extend life back another billion years* although no fossil animals have been identified as yet pertaining to this particular era. Of course the obligatory trinity for life's existence and the propagation of the species: food-shelter-mates, as well as the chemistry of photosynthesis and the intricacy of the various forms of food-webs are all put into proper perspective.

Not satisfied, however, with his elucidation of the interrelationships amongst organisms, the sediments, and the local depositional environment, Dr. Laporte outlines how to go about collecting and examining fossils so as to come to a succinct understanding and full explanation of ancient forms of life. Paralleling Charles Lyell's "Uniformitarianism" ("the present is the key to the past"), he coined the "Rule of Analogy" to utilize the inductive and inferential nature of paleoecology. He impresses on us that the hard parts of extinct animals such as teeth and shells, and their rapid burial would be prerequisites for them ever to become fossils.

Summarizing, we see how paleoecological interpretation of deep sea sediments and their fossil faunas of the Pleistocene era leads to a finer conception and understanding of this particular time in earth history. We come to realize the overall importance of the ecological idea in determining the abundance and apportionment of organisms.

"Ancient Environments" makes a determined and fine contribution to other related areas of science and should become an excellent reader for both the beginning and the advanced student of paleontology as well as an efficient and valuable tool in the hands of a competent, modern Earth Science teacher.

—Rudolph Lindenfeld

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Staten Island Institute of Arts and Sciences



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Preliminary Report on Ragweed Pollen Count for Staten Island

by JOAN KOSAN, PH.D.

During August, September, and part of October 1968, the Staten Island Institute of Arts and Sciences initiated the first phase of a long range program to study pollen. This project involved airborne pollen; namely, a daily ragweed pollen count. The study was undertaken as a result of inquiries by a local citizens' group to investigate the role pollen plays in air pollution over Staten Island.

Both giant ragweed, *Ambrosia trifida*, and short, or common, ragweed, *Ambrosia artemisiifolia*, grow profusely on Staten Island. No distinction between the pollen grains of these two species was made in this study as they differ only slightly, both in size and in the modification of the outer pollen wall. However, the two species can readily be distinguished on the basis of their general growth habit and leaf characteristics. (See Figures 1 and 2.)

It was felt that it would be of value to set up a pollen sampling site where data could be collected from one season to another so that valid comparisons could be made. In this way, a ragweed pollen distribution pattern for Staten Island could be established.

Such studies were initiated in 1946 when an extensive ragweed pollen survey of the New York Metropolitan District was carried out. Data for Staten Island was included in this report,¹ and in the ragweed surveys of 1947,² 1948-1949,³ and 1950.⁴ In 1966, incomplete data for the local ragweed pollen count was tabulated by Purex Laboratories, Staten Island, New York.⁵

Location of Pollen Station

In the selection of an appropriate pollen sampling site, the following criteria were established:

1. The site should be geographically centered in Staten Island.
2. It should be on the roof of a relatively high building so that the apparatus should be above the tree tops.
3. It should be an unobstructed roof.
4. There should be open space immediately surrounding the sampling site.
5. It should be accessible every day of the week.



Figure 1. Tall, or giant, ragweed, *Ambrosia trifida*. A coarse annual weed, growing from 12 to 14 feet in height, with large undivided leaves. Flower clusters, as pictured above, release thousands upon thousands of pollen grains.



Figure 2. Common, or short, ragweed, *Ambrosia elatior*, *Ambrosia artemisiifolia*. This species has a bushy habit of growth and finely divided, or lacey, leaves.

The new Institute for Research of Mental Retardation, a six-story building located on Forest Hill Road, met all of these requirements, and was selected as our sampling site. We received the full cooperation of the staff at the Institute.

Procedure

The technics employed in this study were essentially those established by the Pollen Survey Committee of the American Academy of Allergy.⁶ The Durham sampler, a standard device for collecting air samples of pollen, was employed.⁷ An experimental mechanical unit, the intermittent roto-slide sampler, which was obtained from Dr. Eugene Ogden, State Botanist, was also tested.⁸ (See Figures 3a and 3b.)

The Durham sampler consists of two 9-inch stainless steel discs set horizontally 3 inches apart and held together with three struts. A slide holder is located one inch above the center of the lower



Figure 3a. The Durham pollen sampler. See text for description.



Figure 3b. The Durham pollen sampler in foreground and the Intermittent Rotoslide sampler in background atop the roof of the Institute for Basic Research of Mental Retardation, Forest Hill Road, Staten Island. The view is to the southwest overlooking Staten Island with New Jersey in the distance.

steel disc. The supporting rod is 30 inches long and rises from a tripod base which can be secured to a solid platform.

A glass slide, coated with a thin layer of petroleum jelly (75% U.S.P. Petrolatum and 25% U.S.P. mineral oil), is set in a horizontal position in the slide holder of the Durham sampler and exposed to the air for a 24 hour period. The samples reported upon were taken at 9:00 A.M. daily after a 24 hour exposure period.

Each slide sample is treated with a few drops of Calberla's stain,* which facilitates the identification of the pollen grains, and covered with a 2.2 centimeter square cover slip. All the pollen grains under the cover slip are counted under the microscope. A "pollen count" is obtained by dividing the number of pollen grains

*Calberla's Stain: 5 c.c. of glycerine; 10 c.c. of 95% alcohol; 15 c.c. of distilled water; 2 drops of saturated aqueous solution of fuchsin.

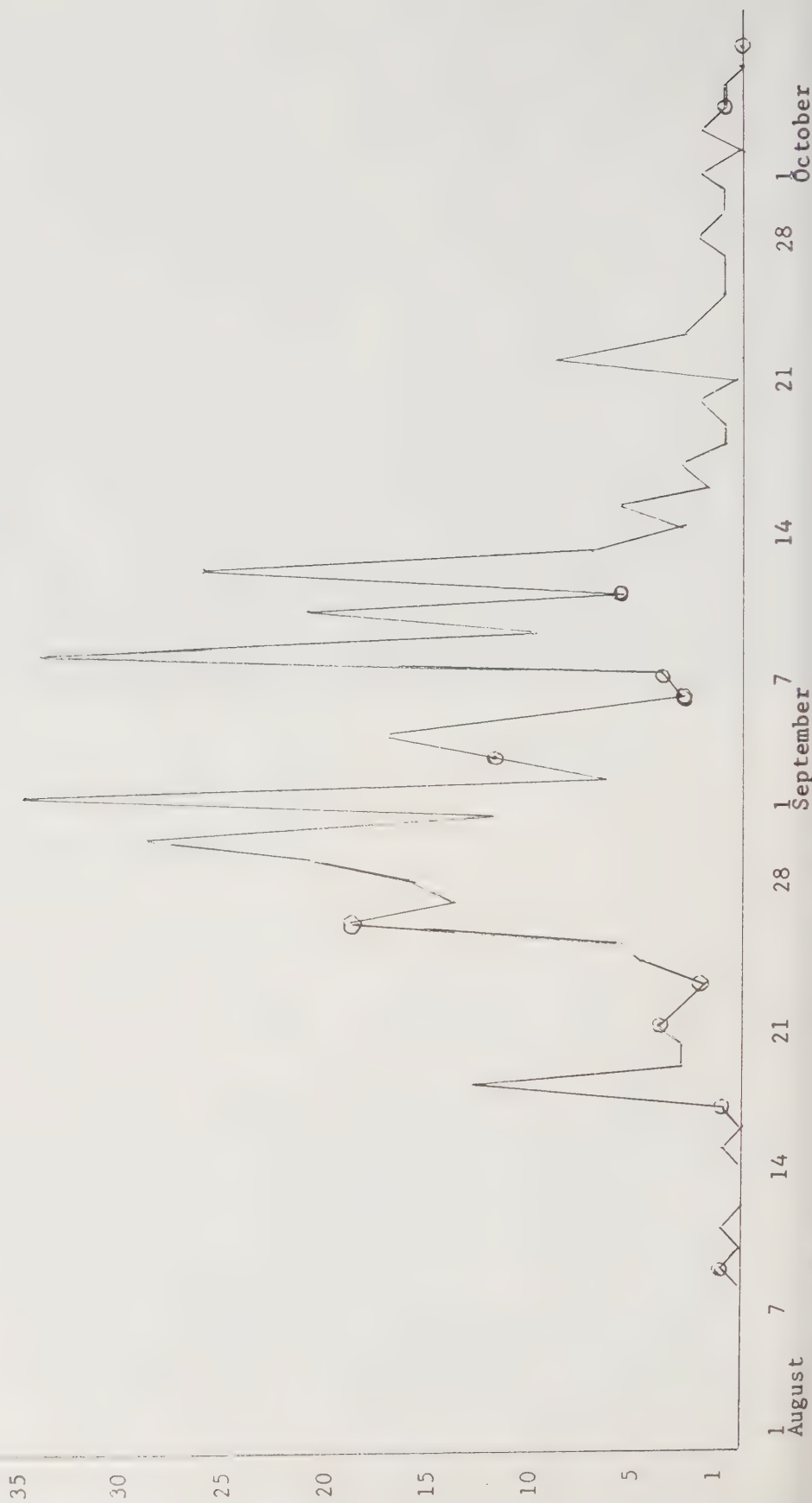


Figure 4 Pollen Count in Stapan, Iceland, 1968. (° denotes precipitation during sampling period)

under the cover slip by 4.84 (the area under the cover slip). This figure is the number of pollen grains per square centimeter, which is the pollen count. The number of ragweed pollen grains per square centimeter of slide during a twenty-four exposure constitutes the pollen count for any particular day. A total of sixty-eight slides were observed in these studies, one for each day between August 1st and October 8th.

It should also be noted that the pollen count for any particular day is based on the sample taken in the previous 24 hour period. When precipitation was recorded during any sampling period, an incomplete count was noted for that day, and was so indicated in the graphic presentation of results.

Results

The intermittent roto-slide sampler, which was developed to correct some of the variables encountered in the Durham pollen count method, met with mechanical failures during the testing season. Therefore, the data obtained with this method will not be presented at this time.

The results with the Durham sampler were as follows (see Figure 4):

The first significant pollen spill occurred on August 18th when a count of 13 was recorded.

On August 26th, a count of 19 was obtained and the peak in August was reached on the 30th with a count of 29.

The seasonal peak was obtained on September 1st with a count of 35, and this was almost matched eight days later when a count of 34 was recorded. Counts of 17, 21, and 26 were also established on September 4th, 10th, and 12th respectively. A final peak of 9 was encountered on September 22nd,

The seasonal total for Staten Island was 394.

Discussion

Since the daily pollen count taken by the Durham method is influenced by factors other than the concentration of pollen in the air,⁹ one must consider these factors, i.e., wind speed, turbulence, orientation of slide holder with wind direction, and precipitation, in the interpretation of the data obtained.

The 1968 seasonal total obtained for Staten Island (394) indicates that there was a light ragweed pollen crop. Counts reported for Staten Island during the 1946 and 1947 seasons of 454 and 530 respectively were taken as low ragweed pollen densities for both these years.^{1, 2}

To what extent meteorological factors and/or the size of the ragweed crop on Staten Island influenced the seasonal count for 1968

cannot be determined in a one-time study. This points to the importance of continued studies for Staten Island so that some basis for comparison can be made from one season to another. The Staten Island Institute of Arts and Sciences plans to maintain the pollen station so that some fruitful results can be obtained.

It is also of interest to note that intensive studies on the effect of wind direction and velocity as it influences the New York City seasonal ragweed pollen count have shown that about half of the New York Metropolitan count can be attributed to wind-borne pollen coming mainly from a westerly direction. Furthermore, the ineffectiveness of a 9 year ragweed eradication program in New York City was attributed to the influence of airborne pollen coming into the city from neighboring areas in which no eradication program existed.¹⁰

Whether or not ragweed will ever be successfully controlled in the New York Metropolitan area remains to be seen. State-wide, inter-State, and even national programs would be needed unless some new and permanent chemical control measures are developed.

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The graph and all photographs used in this article are by the author.

A FIELD GUIDE TO STATEN ISLAND MINERALS

by CURT GEORGE SEGELER and IRVING W. GRELCK

Introduction

It is relatively easy to find interesting and sometimes rare minerals on Staten Island. This guide describes the localities where these minerals can be found. Some have been mentioned previously in the Proceedings but others are recent discoveries. Minerals found in the glacial drift, which covers parts of Staten Island, are omitted as they are not of local origin.

The localities have been grouped according to the geologic classification of the rocks in which the minerals occur and in general geographically from the northern to the southern end of the island. A Hammond's or Hagstrom's Map of Richmond (Staten Island) will aid in finding the location.

LOCALITIES

(The appended tables are keyed to localities by the identifying letters.)

A. *The Diabase Quarries.* Three quarries were operated in the past, but only the Graniteville site is currently accessible for possible collecting, although diabase exposures can be found at other points. The Elm Park quarry site is now part of the Bayonne Bridge approach with diabase exposures on the east side of the road. The Lambert's Lane site is no longer accessible.

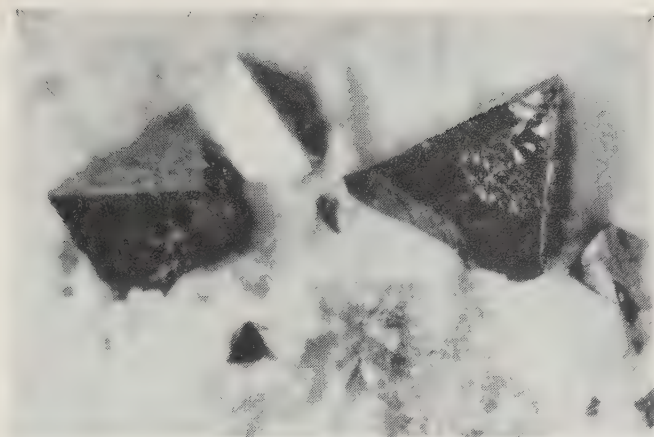
The diabase on Staten Island proved unusually dense, thus making quarrying difficult and expensive. It has been reported that large blocks of the rock were quarried for the construction of Fort Sumter, South Carolina, although the density of the rock failed to avert its downfall and the start of the Civil War. In more recent times, the difficulties in working these rocks seem to have played a significant role in the failure of various contractors who were to lay sewers through the diabase areas. It is as difficult for a mineral collector to extract specimens with the aid of hand tools.

During the operation of the Graniteville Quarry a group of Columbia University students (Hollick 1892) collected abundant calcite and fine stilbite crystals on a field trip, including a crystal of galena, a mineral also found later in 1930 by J. F. Burke of Staten Island. Apophyllite from the diabase is in the Museum collection through the late Captain T. I. Miller. None of these could be found on a field trip in the fall of 1968.

B. *The Granites and Schists.* The recent excavation for the construction of the Richmond Project tunnel brought many interesting minerals to the surface. They can be examined at several accessible localities. The largest dump is on the north side of Forest Avenue near the entrance to the Goethals Bridge. A second dump, for which permission to enter must be secured, is east of the U.S. Gypsum Company plant on the shore at the entrance to the Kill Van Kull. The third pile is small but may yield epidote crystals and tremolite. It is immediately south of Ipes Pond in front of the Fox Hills Housing Project on Manton Place.

Pegmatite bodies were encountered in the course of tunnel excavation, but they were apparently the simple form of pegmatite from which relatively few minerals could be collected. The principal minerals found were quartz, feldspar, mica, and tourmaline, occasionally well crystallized. Some of the rock can be found at the Forest Avenue dump.

Since the Manhattan schist is known to contain an extensive suite of accessory minerals, the identification table which supplements this paper includes only the more commonly occurring



MAGNETITE

(x 25) Sharp octahedrons imbedded in "marmolite." Found in seams on the east slope of Ward's Hill along with dolomite prisms.

species. Of particular interest at the Forest Avenue locality are fine specimens of enstatite (variety bronzite) available in numerous blocks of schist.

The large, sharp, garnet crystals imbedded in a biotite-hornblende schist, encountered in the sinking of Richmond Project tunnel shaft on the Staten Island end, are no longer to be collected. This material was dumped in a small area to the rear of the docks at Tompkinsville. This area has been bulldozed and leveled and is no longer accessible.

C. The Serpentine Localities. The higher elevations on Staten Island where there is little or no glacial drift are characterized by green-colored serpentinite rocks. These are composed primarily of two intergrown minerals, chrysotile and antigorite, the latter constituting as much as 80% of the rock (Schuberth 1968). A detailed study of the petrology of these serpentinites (Behm 1954) is available for those interested in the entire group of minerals found therein as grains and remains of the original rocks. In some places the third polymorph of the serpentine group, lizardite, is also known to occur (Faust and Fahey 1962). The names used follow the classification suggested by Whittaker and Zussman (1956) and the minerals have the idealized formula, $Mg_3Si_2O_{10}(OH)_2$. Available analyses indicate that there is some substitution of Mg by varying amounts of Fe, Cr, Ni, etc. These are known constituents of ultrabasic rocks thus providing supporting evidence that the serpentine was derived from earlier peridotite (olivine and enstatite principally).

These ferromagnesian minerals undoubtedly were the source of the iron ores which were mined on the island during the 19th

century (Proc. 1890). They were also the source of the relatively abundant micro-crystals of magnetite which can be found throughout the serpentine. A one pound mass of chromite has also been found (Hollick 1893), and Behm (1954) states that picotite (magnesian chromite) is a common accessory occurring as tiny grains in the central serpentine.

A little calcium is also present and this shows up in sparse amounts of calcite, aragonite, and dolomite. all of which can be found in fine crystals.

Serpentine weathers readily and there is dissolution of magnesium when the rock is attacked by carbon dioxide solutions. These subsequently may crystallize depositing hydrated magnesium carbonates under the conditions encountered on Staten Island. The two species which have been found are hydromagnesite and artinite, the former being the more abundant. They can be found in many localities on the island. Many old serpentine specimens with white seams labelled "magnesite" in the Staten Island Museum collections appear to be primarily hydromagnesite and artinite. Some were not carbonates at all and proved to be the variety of serpentine called "marmolite" which has been shown to be mostly lizardite or a mixture of chrysotile and lizardite.



HYDROMAGNESITE

(x 50) Tabular transparent monoclinic crystals. Generally these form spherical aggregates but some individual crystals can be found where there is relatively little of the mineral on the rock. This specimen is from the Spring Street locality.

The striking appearance of hydromagnesite and artinite as they occur on the island is largely responsible for the current wave of interest in mineral collecting on Staten Island. The specimens rank in quality with the best from other occurrences as in Italy and California. Specimens from Staten Island have been requested by numerous museums and foreign collectors.



ARTINITE

(x 25) Typical rosette of artinite on serpentine. The needles are monoclinic crystals but being thin it is difficult to determine the terminations. This specimen is from the Spring Street locality.

C. (1) Serpentine Exposures at Spring Street and at the Victory Diner

Two places where hydromagnesite and artinite can be found (1969) are at the western end of Spring Street where building operations have uncovered a large exposure of weathered serpentine, and behind the Victory Diner on Richmond Road not far to the south of the General Berry Housing project. This latter locality has been visited rather frequently and relatively little material other than hydromagnesite can be found in the rocks at the base of the cliff. Many seams which contain both of these magnesium carbonates can be seen at the higher levels of the serpentine. The carbonates, hydromagnesite and artinite, often occur together but artinite is found more frequently in the lower weathered zones.

The artinite found at Spring Street is unusual in that many specimens are of singular beauty, pure white in lovely rosettes of acicular crystals. Even the fissures in the serpentine which are filled with masses of these needle-like crystals are most attractive. Specimens of varying sizes can be found.

Hydromagnesite, long recognized as a hydrated carbonate of magnesia (Wachmeister 1827), occurs in thin transparent crystals which are generally in aggregates forming rather striking little white balls. Both minerals should be viewed with a stereo-binocular microscope to appreciate their full beauty.



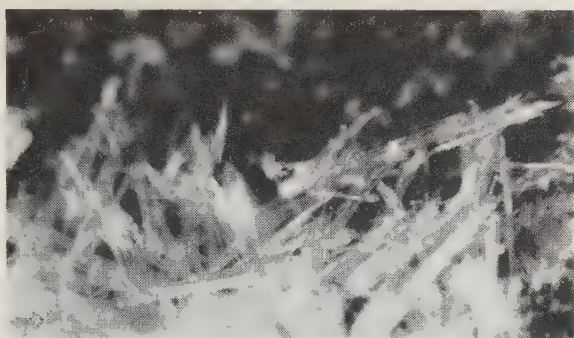
ARAGONITE

(x 50) Flat transparent orthorhombic crystal of aragonite. This specimen is from the Spring Street locality. The mineral occurs in vugs just below the areas where downward-percolating solutions have cemented glacial drift and have filtered into fissures in the underlying serpentine.

There are two naturally occurring magnesium carbonates of similar habit and appearance to artinite, namely: nesquehonite and landsfordite. Both were found originally in an anthracite coal mine at Nesquehoning, Pennsylvania, and have been reported also from a deposit of hydromagnesite at Atlin, British Columbia, and at Conge, Val D'Aosta in Italy. Knowing of these occurrences a diligent search for these two minerals was made but to date neither has been found.

At the Spring Street locality very good micro-crystals of aragonite can be found in the southern part of the knob generally in seams of the serpentine variety, deweylite (most deweylite is a mixture of chrysotile or lizardite with the magnesium members of the montmorillonite group, stevensite).

In the same part of the knob small masses, or veinlets, of nickeliferous serpentine may be encountered. Our tests indicate that the varietal name, genthite, might be appropriate whereas Pough (1937) states that his tests suggested "nepouite." These distinctions seem unnecessary since the nickel is present in the serpentine as a partial substitution for magnesium. The nickel mineral can be spotted in the field by its apple-green color as distinct from the various serpentine shades of green.



EPSOMITE

(x 10) Tangled fibres of epsomite attached to serpentine. Because of the quick dehydration of this mineral, the photo actually shows *hexahedrite*. From Ward's Hill.

Other minerals which occasionally can be found in fine specimens are talc and brucite. The former is relatively abundant in large masses in the southwestern part of the knob while brucite has been found in unusually good crystals on the northern side. Both are actually present as disseminated masses and grains at many places in the serpentine rocks on Staten Island.

C (2) *Serpentine Exposure at Richmond Parkway Road Cut*

At the entrance to the proposed Richmond Parkway from the Staten Island Expressway (which is two blocks east on Lightner Avenue from Todt Hill Road), there is a road cut through the serpentine. Here are calcite crystals of a rather uncommon habit consisting of prism and rhomb in sizes up to an inch or more, and occasional aragonite crystal groups may be found. This serpentine exposure is comparatively unweathered up to now. This may account for the lack of magnesium carbonate minerals. Magnetite crystals are present up to 3/16ths of an inch in size.

C (3) *Serpentine Exposure on Ward's Hill*

Ward's Hill is close to the northeastern end of the serpentine ridge bounded by Victory Boulevard and St. Paul's Avenue. Both the eastern and western sides of the hill have rock exposures where interesting minerals may be found. The west side of the hill yields epsomite when conditions are suitable. It has been reported also from other localities (McCulloch 1937). Epsomite is found at places on the hill where there are small overhangs and where it is damp. A source of sulfur oxides must be available to form this mineral. It is likely that our polluted atmosphere fills this requirement. Other sulfur sources could be the presence of minerals such as pyrrhotite. Epsomite loses water in dry environments and alters to magnesium sulfate hexahydrate which corresponds to the mineral.



DOLOMITE

(x 10) Unusual crystals showing prisms rather than simple rhombs ordinarily found. Terminations include the basal pinacoid of the larger crystals and rhombs on the very small ones. Found in seams of marmolite on the east slope of Ward's Hill.

hexahydrate. Undoubtedly both of these minerals occur depending upon the humidity. Since epsomite is quite soluble in water, this mineral would tend to disappear in rainy weather. Good micro-crystals of magnetite occur on Ward's Hill.

The east side of Ward's Hill is reached from the end of Swan Street by going northward up the hill. The principal mineral of interest is an unusual prismatic dolomite found in micro-crystals in thin seams of "marmolite." These seams are white to cream-colored, up to about one-half inch thick, and are in small lenses. They contain as brilliant sharp micro-crystals of magnetite as are to be found on Staten Island. The crystals of dolomite were first found by Joseph F. Burke, a trustee of the Museum, and described by Dr. Frederick H. Pough (1937) who also noted the presence of nickeliferous serpentine (nepouite was the varietal name indicated, cf. Locality C [1]). Burke also reported the presence of some thin seams containing graphite.



GOETHITE

(x 25) Rare sharp, shiny, orthorhombic crystals of goethite. The common occurrence of this mineral is in botryoidal masses, either black or brownish. This specimen is from the Signal Point locality.

C (4) *Serpentine Exposure on Pavilion Hill*

The northerly terminus of Ward's Hill is known as Pavilion Hill and can be reached from Swan Street. The most uncommon mineral to be found here was widely known as "fibrous serpentine." It often looks like splintered wood. For the most part this is the mineral, anthophyllite, an orthorhombic amphibole. Dendrites (pyrolusite) are encountered from time to time particularly on slickensided serpentine. Talc is abundant hereabouts as is brucite.

D. Iron Ore Bodies. Numerous residual iron ore bodies, overlying the serpentine, occur at various locations along the ridges. Some of these were sites of iron mining during the 19th century. The ore was goethite mixed with quartz. Much of the goethite in the northern localities is reniform with shiny black or brown surfaces. Extremely rare are the sharp micro-crystals of goethite in arenaceous borders of goethite. Velvety goethite is found on the surface of many of the goethite pockets. Stalactitic forms of goethite frequently are encountered. Those ore bodies found in the southerly localities generally consist of pisolitic goethite which is locally known as "shot ore."

Quartz occurs in doubly-terminated crystals of a green or yellowish color. When these quartz crystals are examined at 24X with a stereo-binocular microscope, inclusions of stellate clusters of metallic needles of goethite can be found. Some of these which are near the surface of the quartz may have lost their goethite leaving a stellate cluster of white needle-like cavities, or negative

crystals. These appear to be a white mineral, but closer examination will reveal that these are simply residual cavities.

The known localities include:

1. Signal Point area. On the down slope from Signal Hill Road.
2. Longview Road. Between the road and the Expressway.
3. The north side of the ridge above Clove Lake.
4. Todt Hill Road opposite the Seminary.

FURTHER NOTES ON SOME MINERALS OF SPECIAL INTEREST FOUND IN THE SERPENTINE LOCALITIES

Magnetite. Analysis of the micro-crystals of magnetite found associated with the ferromagnesian rocks on most of the higher elevations shows that they contain approximately 1.2% chromium. Serpentinites derived from peridotites are considered to be potential sources for the mineral chromite. Both magnetite and chromite belong to the same mineral group with the same crystal forms. Magnetite is attracted strongly by a magnet whereas chromite is feebly magnetic. Thus the collector has a simple field test to which he can resort to learn whether or not he has found an octahedron of magnetite. Crystals of chromite are exceedingly rare. In the field work supporting this report many crystals were tested, as were numerous small masses, but no chromite was found. [Viz. Localities: C. Spring Street, Todt Hill, Ward's Hill.]

Artinite was named in 1902 by an Italian mineralogist, Brugnatelli, after Ettore Artini (1866-1926) Professor of Mineralogy at the University of Milan. Artinite is a low temperature hydrothermal mineral commonly found as veinlets or crusts along fracture surfaces in serpentinitized ultra basic rocks. This is in fact the nature of the Staten Island serpentinite as explained in detail by Schubert (1968).

Of interest in this respect is the description by James Pierce (1818) of "a few mineral specimens characteristic of Staten Island, including native carbonate of magnesia, in acicular crystals. I discovered this new form and locality of magnesia in examining the strata exhibited in an excavation now making, under the delusive expectations of finding gold, about three miles from the Quarantine. In descending the shaft, sunk perpendicularly in steatite, magnesite, veins of talc, and green translucent asbestos (*sic*) were observed at depths from 6 to 35 feet. The magnesite was found to embrace veins and cavities containing carbonate

of magnesia, in very white acicular crystals grouped in minute fibres radiating from the sides, but not always filling the veins and cavities. The crystals were, in some instances, suspended, assuming a stalactical form. This carbonate of magnesia dissolves entirely in diluted sulphuric acid, with considerable effervescence and chemical action, producing a bitter compound from which salts of easy solution are formed by evaporation. The magnesite in which these crystals are found, appears to be composed of carbonate of magnesia, steatite, and talc. . . . Magnesite may perhaps be found at this place in quantity sufficient for a successful manufacture of Epsom salts. Small regular . . . crystals of mica were noticed in steatite. . . .”

The description of the “carbonate of magnesia” is of great interest because it fits the mineral now known to be artinite and Pierce’s clear recognition and description of this mineral antedates by nearly 100 years its naming. The description of the “mica-like” specimen fits the mineral brucite which is common in many island localities. Brucite had been discovered at about the same time in New Jersey by Dr. Archibald Bruce, after whom it is named, and who was the sponsor of Mr. Pierce.

Extensive studies have been made regarding the dissolution of magnesium from silicate rocks and the subsequent formation of various carbonates. The processes depend in large measure on the concentration and pressure of CO_2 in the solution which is infiltrating the rocks. Actually there are twenty minerals involving magnesium carbonate (and other atoms in some of the minerals). On Staten Island only three have been definitely identified in the carbonates collected by the authors: dolomite, artinite, and hydromagnesite.

Magnesite has been reported in the literature and there are specimens so labeled in the Museum collection. Those tested by the authors turned out to be hydromagnesite (or in some cases not carbonates at all). Nor was any magnesite found in the course of this study. On the basis of the published laboratory studies of the CO_2 pressures and concentrations favorable to the formation of magnesite, it is not probable that this mineral would have formed on Staten Island, at least not in the carbonate areas produced by weathering.

Out of the twenty possible carbonates, twelve appear to be theoretically possible since the requisite elements are available. Some of these—brugnatellite, pyroaurite, and sjogrenite—involve Mg and Fe only, both of which are present in the serpentinite. None of these minerals was found in the course of this study. The

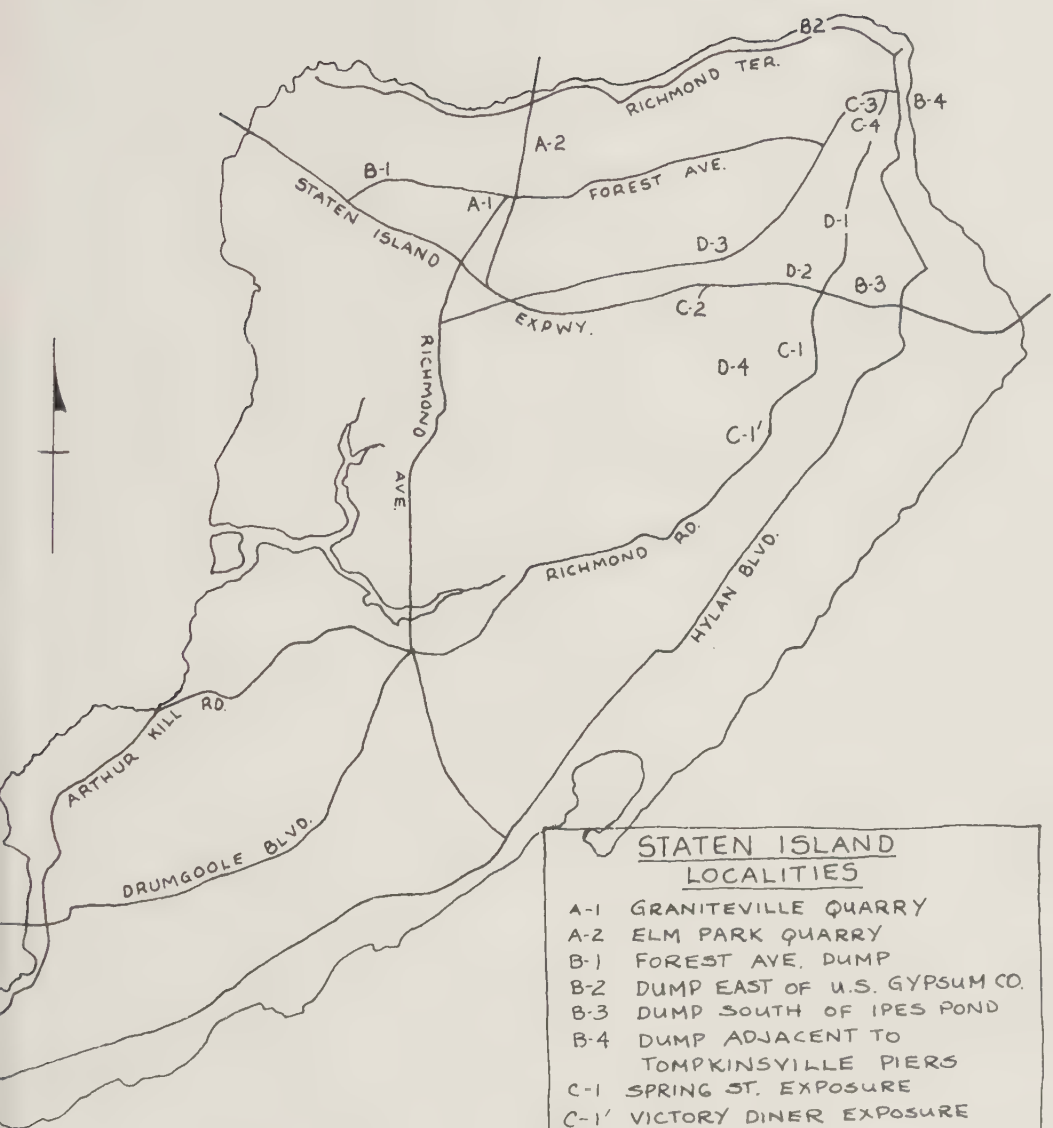
carbonates which include Ca are necessarily scarce since analysis of the serpentinite shows little or no Ca. The same is true of Na, K and Al. Juan (Hans) J. Behm (1954) comments as follows on this point: "Consequently, it is difficult to escape the conclusion that the lime and various other carbonate products must have been of extraneous origin, possibly from ancient overlying materials." [Viz. Localities: C (1).]

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All photographs used in this field-guide are by the authors. The map of Staten Island was prepared by Irwin Grelck.

The accompanying microphotographs were taken using a Leitz Makam camera attachment for microscopes and Zeiss Luminar objectives, equipped with internal diaphragms to control depth of focus. The lens combinations were 25mm Luminars with 5x or 10x oculars, except for the 10x enlargements which required a 2x objective in place of the Luminars. Lighting was by multiple flashes of a strobe light moved around to achieve modeling.



STATEN ISLAND LOCALITIES

- A-1 GRANITEVILLE QUARRY
- A-2 ELM PARK QUARRY
- B-1 FOREST AVE. DUMP
- B-2 DUMP EAST OF U.S. GYPSUM CO.
- B-3 DUMP SOUTH OF IPES POND
- B-4 DUMP ADJACENT TO
TOMPKINSVILLE PIERS
- C-1 SPRING ST. EXPOSURE
- C-1' VICTORY DINER EXPOSURE
- C-2 TODT HILL CUT
- C-3 WARD HILL
- C-4 PAVILION HILL
- D-1 SIGNAL POINT
- D-2 LONGVIEW RD.
- D-3 RIDGE ABOVE CLOVE LAKE
- D-4 TODT HILL RD. OPPOSITE
SEMINARY.

APPENDIX

The following tables have been compiled to provide a quick reference to the minerals of Staten Island discussed in this Field Guide. While the list for those associated with the serpentinites is essentially complete, that for the schist and granitic intrusives, because of its extensiveness, includes only those minerals of notable interest.

The minerals are listed alphabetically and are separated according to their geological occurrence.

Mineral	Chemistry	Crystal System	H	S.G.	Habit	Occurrence	Location
Antigorite	$Mg_3Si_2O_5(OH)_4$	Monoclinic	2 - 5	2.2-2.65	Platy structure. Generally light to dark green.	Forms essential constituents of the serpentinite.	C
Chrysotile	" " "	" " "	"	"	Fibrous, light yellow, green, etc.	As fibrous veins and inter-mixed with antigorite to form serpentinite.	C

VARIETAL NAMES FOR SERPENTINE

Based on Physical Properties rather than Chemistry

Name	Defining Characteristics	Occurrence	Location
Deweylite	Translucent. White, brownish and amber coatings. Often botryoidal. Brittle. Usually highly cracked.	Filling seams and as coatings on carbonates.	C (1)
Genthite (Nickeliferous serpentine) Validity of species not yet determined.	Conspicuous apple green. Translucent to opaque.	In seams and as incrustations.	C (1)
Marmolite	White to light green. Transparent to opaque. Waxy.	In seams, particularly along the northeastern serpentinite outcrops.	C (1), (3), (4)

MINERALS OF THE SERPENTINITE ENVIRONMENT

Mineral	Chemistry	Crystal System	H	S.G.	Habit	Occurrence	Location
Anthophyllite	$(\text{Mg, Fe})_7\text{Si}_8\text{O}_{22}(\text{OH})_2$	Orthorhombic	3.5-6	2.85 3.2	White, clove-brown, brownish-green. Columnar aggregates.	As compact fibrous seams. Weathers to loose, flexible fibers.	C (4)
Aragonite	CaCO_3	Orthorhombic	3.5-4	2.95	White. Transparent to translucent. Crystals tabular or acicular. Generally as radiating crystal aggregates. Crystal length: 3 - 4 cm.	Flat aggregates in narrow open seams. Frequently encrusted by translucent, amber to cream colored deweylite.	C (1)
Artinite	$\text{Mg}_2(\text{CO}_3)(\text{OH})_2 \cdot 3\text{H}_2\text{O}$	Monoclinic	2.5	2.02	White. Transparent to translucent. Acicular crystals--occurring as crusts, radiating spherical aggregates and as cross fiber veinlets.	On walls of open seams in weathered rock. Often intermixed with hydromagnesite. Rock relatively firm.	C (1)
Brucite	$\text{Mg}(\text{OH})_2$	Hexagonal	2.5	2.39	White. Transparent to translucent. Pearly, anhedral plates and scales. Foliated masses. Crystals rare.	Disseminated throughout rock.	C (1)
Calcite	CaCO_3	Hexagonal	3.0	2.71	Crystals common as white, transparent to translucent, short prisms with rhombohedral terminations. Pinacoid rare. As crystalline veins.	Isolated crystals in clay-filled seams. In veins to three inches thick.	C (2)
Dolomite	$\text{CaMg}(\text{CO}_3)_2$	Hexagonal	3.5-4	2.85	Slender hexagonal prisms with basal pinacoid. White. Transparent to translucent. Crystal length to 2 mm.	Crystals imbedded in white marmolite seams.	C (3)

Epsomite	$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$	Orthorhombic	2-2.5	1.68	White. Transparent to translucent. Acicular crystals and fibrous efflorescences. Crystals to 1 cm. Soluble in water. Dehydrates to hexahydrate. ($\text{MgSO}_4 \cdot 6\text{H}_2\text{O}$).	Efflorescent coatings on serpentinite where capillary moisture is available.	C (3)
Hydromagnesite	$\text{Mg}_4(\text{OH})_2(\text{CO}_3)_3 \cdot 3\text{H}_2\text{O}$	Monoclinic	3.5	2.24	White. Transparent to translucent. In bladed crystals, as rosettes, swollen fragile crusts and botryoidal coatings. Also massive and chalky. Crystals to one mm.	Crystal coatings on open seams, often intermixed with artinite. Rock matrix often deeply weathered and crumbly.	C (1)
Magnesite	MgCO_3	Hexagonal	3.5-5	3.0-3.2	White. As compact, earthy masses.	Reported as occurring in seams in serpentinite. None observed during present field work nor in the collections of the Staten Island Museum.	C (?)
Magnetite	Fe_3O_4	Isometric	6	5.18	Black. As minute octahedrons and irregular grains. Crystals to 2 mm. Samples often contain minor amounts of chromium.	Crystals and grains disseminated throughout rock. Superb micro-crystals imbedded in marmolite veins.	C (2) C (3)
Talc	$\text{Mg}_3\text{Si}_4\text{O}_{10}(\text{OH})_2$	Monoclinic	1	2.7-2.8	White to light green foliated masses.	Lentic masses and scales disseminated throughout rock	C (1) C (4)

MINERALS OF THE SERPENTINITE ENVIRONMENT

MINERALS OF THE RESIDUAL IRON ORE BODIES

Mineral	Chemistry	Crystal System	H	S.G.	Habit	Occurrence	Location
Goethite	HFeO_2	Orthorhombic	5-5.5	3.3-4.3	Black, brownish-black. In colloform and stalactitic fibrous aggregates. Color: brownish-yellow in pisolitic and massive forms. As radiating crystal aggregates in quartz. In crystals on ore.	In residual iron ore bodies on the crests and flanks of serpentinite ridges. Associated with crystallized and massive cellular quartz.	D
Quartz	SiO_2	Hexagonal	7	2.65	White to green. Transparent to opaque. Crystals commonly doubly terminated and in radiating aggregates. Also massive and in druses. Often contains goethite as inclusions.	With goethite in ore bodies.	D
Magnetite Talc Calcite, etc.	See "Minerals of the Serpentinite Environment"					In minor amounts in most of the ore bodies.	D

MINERALS OF THE SCHIST AND GRANITIC INTRUSIVES

Mineral	Chemistry	Crystal System	H	S. G.	Habit	Occurrence
Almandine	$\text{Fe}_3\text{Al}_2 (\text{SiO}_4)_3$	Isometric	7	4.25	Deep red. Transparent to translucent. As sharp dodecahedrons to 2.5 cm. Often contains inclusions of mica and hornblende.	In schist. Large crystals common where associated with abundant biotite and hornblende.
Bronzite	$(\text{Mg}, \text{Fe}) \text{SiO}_3$	Orthorhombic	5.5	3.3	Brown, olive green. Translucent to opaque. As submetallic bronze-like cleavable masses.	Anhedral masses in schist.
Epidote	$\text{Ca}_2(\text{Al}, \text{Fe})_3 (\text{SiO}_4)_3 \cdot (\text{OH})$	Monoclinic	6-7	3.35-3.45	Light green, yellow. Transparent to translucent. Crystals to 3 mm.	In pegmatite intrusions as finely crystalline veins and as crystals in vugs.
Hornblende	$\text{Ca}_2\text{Na}(\text{Mg}, \text{Fe}^{++})_4 (\text{Al}, \text{Fe}^{++}, \text{Ti})_3 \text{Si}_6\text{O}_{22}(\text{O}, \text{OH})_2$	Monoclinic	5-6	3.2	Black, dark green. Translucent to opaque. In flat prismatic crystals.	In schist. Often abundant and forming a hornblende schist.
Stilbite	$(\text{Ca}, \text{Na}, \text{K})_3\text{Al}_5 (\text{Al}, \text{Si})-\text{Si}_{14}\text{O}_{40} \cdot 15 \text{H}_2\text{O}$	Monoclinic	3.5-4	2.1-2.2	Light brown, pink. Translucent. In radiating prismatic aggregates.	In schist. Occurs as flat aggregates in narrow seams.
Tremolite	$\text{CaMg}_5\text{Si}_8\text{O}_{22} (\text{OH})_2$	Monoclinic	5-6	3.0-3.3	White, light green. Transparent to translucent. As massive radiating aggregates. Occasionally in silky fibers.	In schist. Often abundant and forming a tremolite schist.

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Bird Counts on Staten Island 1968-1969

by MATHILDE P. WEINGARTNER

Annual Christmas Bird Count, December 21, 1968

The Annual Christmas Bird Count was taken by members of the Section of Natural History under the auspices of the National Audubon Society on Saturday, December 21st. The day was mild with an overcast sky and southwesterly winds averaging about ten miles per hour. This moderate weather followed a week of strong winds and temperature cold enough to freeze all the ponds leaving only a small area of open water in each. Underfoot the ground was muddy because the top strata had begun to thaw although the soils were still frozen deeper down. A few patches of snow persisted in undisturbed areas.

These conditions set the scene for an interesting day for bird-watchers. Regular song birds were not very plentiful, most fresh-water ducks had been driven to salt creeks or the beach; but there were still six Great Blue Herons in the salt marshes which are tidal and therefore not frozen, and some of the hardier song birds were still around.

Conditions were best along the beaches for observing large numbers of ducks resulting in the high count on Mallards, Scaups, Goldeneyes, and Buffleheads. Most sea ducks were conspicuous by their absence. There were no Canada geese along the beach, but Purple Sandpipers found things to their liking and were present in the largest number ever counted. This was also true of the 12 Dunlin. In the Davis Wildlife Refuge, a Spotted Sandpiper settled in at a creek to feed and a high count of Common Snipe was reported this year, indicating that the ground was not too frozen for them to obtain their preferred diet of worms from the soft mud near brooks.

The high count in Hawks, Black-backed Gulls, and Starlings may be attributed to the ever-increasing garbage dumps in the Green-ridge area, which has become a feeding ground for these birds.

The hawks feed on the mice and rats that breed in such situations, and the gulls and starlings like to eat the plentiful garbage available there.

The count in Kingfishers was high showing that creeks and brooks were still open. There was a definite increase in the number of House Finches, the bird that has been introduced in Long Island from the West Coast. They resemble Purple Finches and some people may confuse them also with Redpolls. Downcys, Robins, and Tree Sparrows are also at a high count this year.

Although many flocks of Evening Grosbeaks were reported in late November and at the beginning of December, there were none to be found on the day of the count.

Brant, the small sea goose, which at one time almost disappeared from our North Atlantic shores, has come back with a spectacular recovery. Brants are included in our Staten Island count for the first time. Another first was the sighting in Snug Harbor Cemetery of a Yellow-bellied Sapsucker which was pecking on the bark of Austrian pines. This is not a rare bird on Staten Island but had never been seen before on the day of the annual count.

The observers were: Doris Barlow, Mary and Philip Benjaminson, Esther Brewer, Dean Chipman, Howard Cleaves, Robert Clermont, Kendrik Cole, Charles Fallon, Howard Fischer, Henry Flamm, Hilda Hansen, Stanley Kaufman, Tom Matterfis, Anna Meyer, Charles Pearson, Celia Polomany, Esther Swayer, Nick Wagerik, and Mathilde Weingartner.

A curious incident, as yet unexplained, occurred when Charles Fearson, who was walking across a meadow, was repeatedly attacked by a muskrat which bared its teeth and charged at Mr. Pearson.

<i>Listing of Birds Seen:</i>		Canvasback	3
Common Loon	1	Greater Scaup	11,387
Red-throated Loon	1	Common Goldeneye	588
Horned Grebe	75	Bufflehead	453
Great Cormorant	2	Oldsquaw	369
Great Blue Heron	6	Common Merganser	2
Black-crowned Night Heron	20	Red-breasted Merganser	7
Brant	16		
Snow Goose	1	Red-tailed Hawk	6
		Rough-legged Hawk	15
Mallard	302	Marsh Hawk	10
Black Duck	833	Sparrow Hawk	15
Pintail	1		
Green-winged Teal	85	Ring-necked Pheasant	61
American Widgeon	8	Killdeer	5

Ruddy Turnstone	9	Cedar Waxwing	2
Common Snipe	13	Starling	12,394
Purple Sandpiper	155	Myrtle	9
Dunlin	12		
Sanderling	23	House Sparrow	178
		Eastern Meadowlark	4
Great Black-backed Gull	5,844	Red-winged Blackbird	166
Herring Gull	27,536	Common Grackle	4
Ring-billed Gull	40	Brown-headed Cowbird	24
Bonaparte's Gull	1,041		
		Cardinal	59
Mourning Dove	118	House Finch	37
Short-eared Owl	3	Pine Siskin	5
Belted Kingfisher	4	American Goldfinch	22
Yellow-shafted Flicker	9	Rufous-sided Towhee	3
Red-bellied Woodpecker	2	Savannah Sparrow	2
Yellow-bellied Sapsucker	1	Slate-colored Junco	94
Hairy Woodpecker	2	Tree Sparrow	296
Downy	50	Chipping Sparrow	1
Horned Lark	26	Field Sparrow	14
Blue Jay	64	White-throated Sparrow	106
Common Crow	236	Fox Sparrow	27
Fish Crow	1	Swamp Sparrow	4
		Song Sparrow	130
Black-capped Chickadee	117	Indian Hill Mynah	1
Tufted Titmouse	5	(a cage bird which had escaped	
White-breasted Nuthatch	29	and is spending the winter in the	
Red-breasted Nuthatch	3	Livingston vicinity)	
Carolina Wren	2		
Mockingbird	21	<i>Total of Individuals Counted:</i>	63,262
Robin	43	<i>Total of Species Seen:</i>	76

Annual Waterbird Count, January 12, 1969

Even though a count of the waterbirds is included each year in the regular Audubon Christmas Count, the Conservation Department of the State of New York asks that a count of the waterfowl be taken about the middle of January. Since the Conservation Department sets regulations on hunting, which differ each year because they are based on the abundance or rarity of certain species, the members of the Section of Natural History try to cooperate with this count in the New York area. Our count is then included in that of New York City.

This year we were particularly unfortunate as a result of the weather, both in the number of birds seen, and in the discomfort to the observers. There had been several days of hard freeze since

the beginning of the year and all ponds and lakes were frozen solid. Even the yacht basin at Great Kills Marine Park was thick with ice as were many of the creeks, with no open water anywhere. All waterfowl were forced into the bay, as a result, and in some places were quite far off shore. Therefore even with the use of a telescope it was difficult to count the individuals. Undoubtedly some of the birds had also moved further south because of the weather.

The observers, though bundled up almost beyond recognition could see only through tearing eyes glued to binoculars which fogged repeatedly if you tried to protect your eyes from the strong winds and sun.

The usual number of species was recorded but the numbers of individuals counted within the species were reduced.

The Red-throated Loon and the 75 Horned Grebe were seen between South Beach and Hoffman Island, an area of open water with few ice floes. One of the Canada geese had a bright red band on each leg, the meaning of which was not determined.

List:

Red-throated Loon	1
Horned Grebe	75
Brant	44
Canada Goose	4
Mallard	150
Black	460
Pintail	4
American Widgeon	2
Canvasback	6
Greater Scaup	2,960
Common Goldeneye	510
Bufflehead	346
Old Squaw	19
Hooded Merganser	1

Total of Individuals Counted: 4,582

Total of Species Seen: 14

PROCEEDINGS

Staten Island Institute of Arts and Sciences



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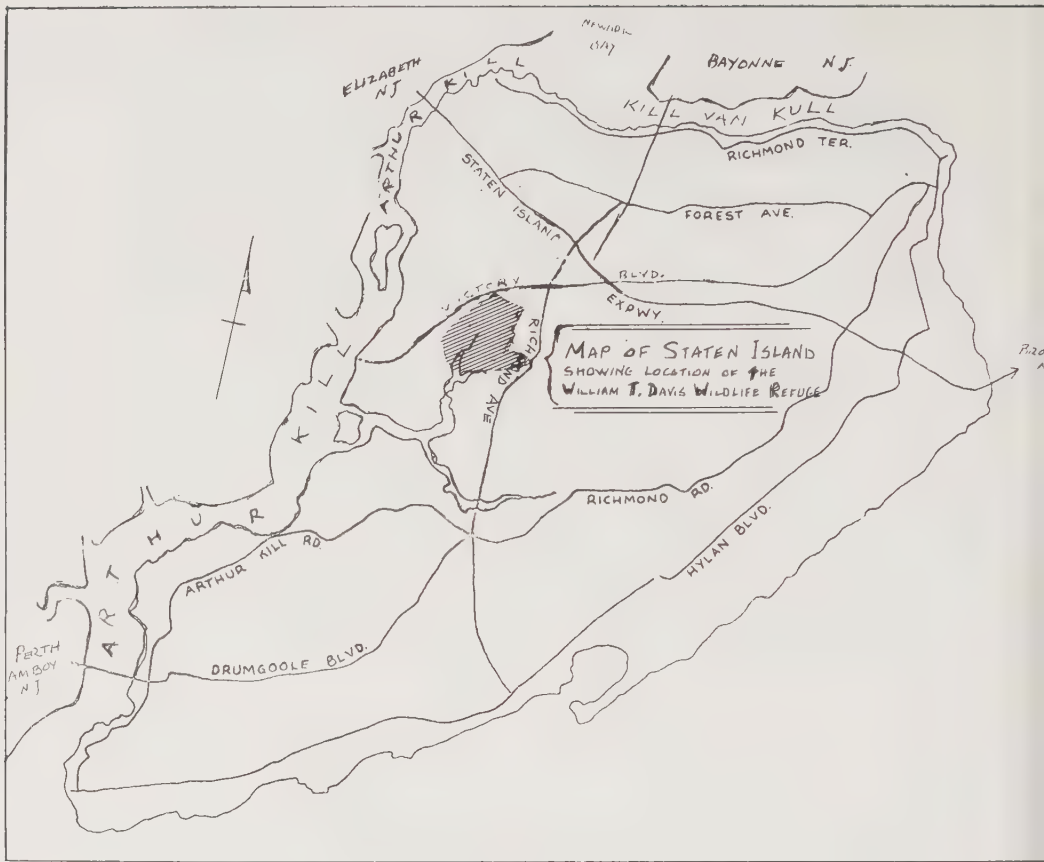
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by Mathilde P. Weingartner, George O. Pratt, Jr., and G. K. Schneider

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The William T. Davis Wildlife Refuge and its Environs

by

MATHILDE P. WEINGARTNER

GEORGE O. PRATT, JR.

GAIL K. SCHNEIDER

History of Prior Land Use, 1800-1933. The William T. Davis Refuge occupies a majority of the land area between Signs Road on the North, Victory Boulevard on the West, Richmond Avenue on the East, and Main and New Springville Creeks on the South.

In the 19th century most of this land was divided into fair-sized lots owned by various private individuals and their families. Much of the land was farmed and yielded a variety of crops such as corn, potatoes, wheat and tomatoes. The marshy areas provided good crops of salt hay which was cut and sold for packing vegetables for market; for mulch; for cattle bedding. A saw-and-grist mill was operated on Main Creek for a time; a small cannery was located on Travis Avenue about where the main trails of the Refuge are now.

About 1880, two water supply companies purchased lots from three of the local owners. Artesian wells were sunk to provide a

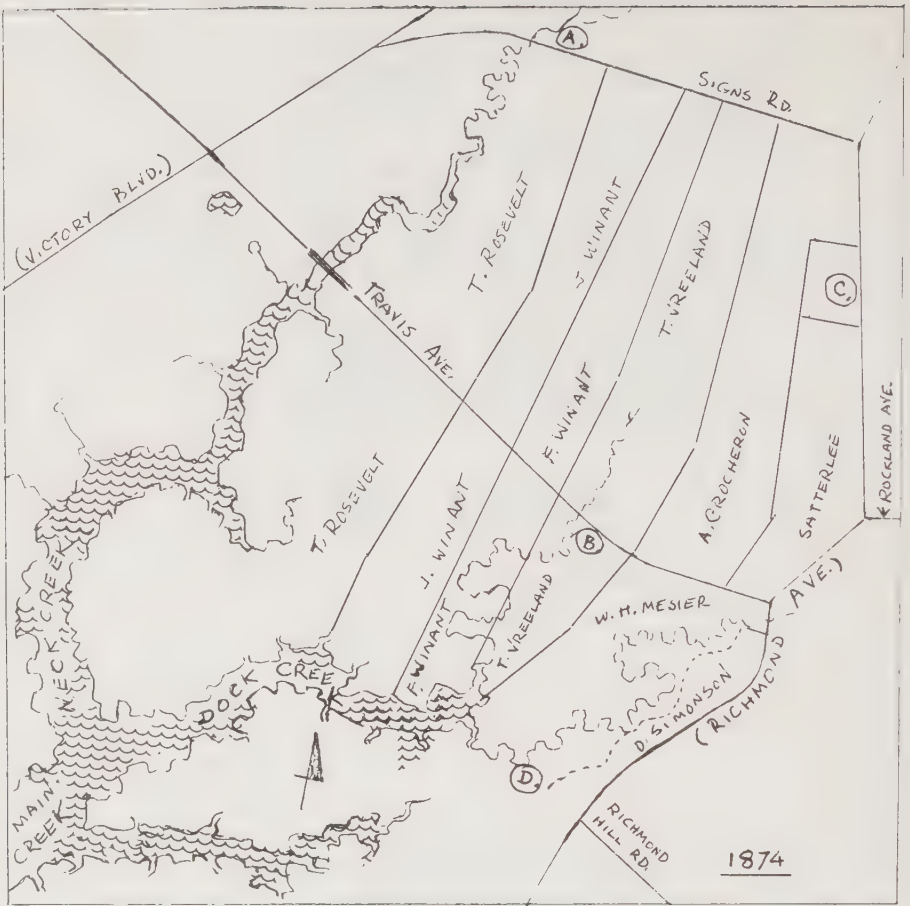


Fig. 1 New Springville in 1874, showing lot division according to the atlas of that year. A. Location of grist-and-lumber mill. B. Location of preserving house. C. Location of Asbury Church and graveyard, both still in existence. D. Location of Springville Dock.

continuous water supply, which they could still do although the water is unsafe and the wells have been capped.

An intervening strip of land continued to be farmed into the 20th century and remained privately owned until the 1940's.

By the 1920's, the Catskill Water System had been extended to the Island. New York City acquired the lands previously owned and operated for water supply, since private water supply companies were no longer necessary. All of these land acquisitions were placed in the care of the City's Department of Parks.

Some of the past owners of these lands had used them for summer retreats until the prevalence of mosquitoes and fear of epidemic disease caused them to sell. Mosquitoes which bred

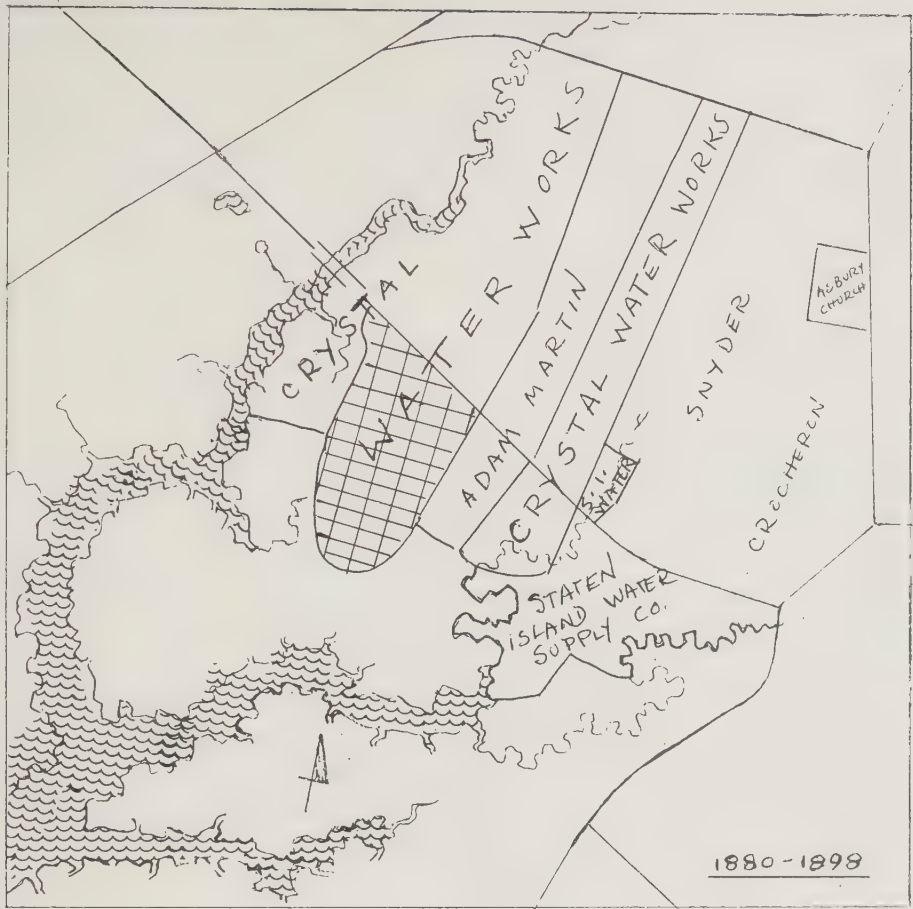


Fig. 2 1880-1898. Showing change of ownership and use. Cross-hatched area indicates boundaries of land first acquired by Crystal Water Works which later added other parcels, as shown. By 1898, Crystal Water Works and Staten Island Water Supply Company had acquired the holdings shown.

in salt marshes had long been one of Staten Island's worst handicaps. The City attempted to deal with these insects in 1910 by ditching the marshes and spraying them with oil. The furrows still mark the marshes of the Refuge today, many of them bordered by high tide bush which breaks up the even stretches of marsh grasses and other salt vegetation.

Marshland has long been considered wasteland by the average person, but among fishermen, biologists, and ecologists, marshland is one of the preferred and most fertile land types. The biologist looks upon it as the "nursery" for much of our food fish because its environment shelters fish fry and also provides the constant supply of microscopic organisms small fish need for food.

Marshes supply shelter and food for migrant waterfowl as well, and those marshes situated along a fly-way feed and protect these birds, but only if the marsh itself is safe from hunters. Marshes along fly-ways therefore enable the birds to reach their wintering grounds in good condition. Protecting its marshes immediately becomes one of the management requirements of a wildlife refuge which is so situated.

Use and Management from 1933 to 1954. In the early 1920's Staten Island and New York City newspapers published accounts of efforts being made to have the City set aside officially a wild area as a bird sanctuary on Staten Island. The original idea was that such areas should be maintained in each park which was to be developed on the Island. Eventually this was discarded in favor of a park which in itself would be used solely as a sanctuary. By 1930 three different parkland areas — Wolfe's Pond, Latourette, and New Springville — were suggested as possibilities, and in 1933 51 acres in New Springville were selected as the location for the bird sanctuary. Almost ten years of negotiations among the New York City Department of Parks, the National Audubon Society, and the Staten Island Institute of Arts and Sciences under the leadership of William T. Davis, Staten Island's foremost naturalist, preceded the final decision on the location.

The selection of this area by the City may have been prompted for other reasons than those of good conservation practices, but its relatively protected situation (at the time), its quantity of marshland, its trees and bushes offering excellent cover and additional food, made it ideal for a bird sanctuary.

All management and most of the maintenance had to be carried out with voluntary assistance. The Sanctuary was enclosed with a low wire fence designating its boundaries and an inner woodland was fenced with a six-foot wire mesh fence which Mr. Davis paid for personally. The double fencing together with the Sanctuary's stated purpose helped to obstruct access to creeks and marshes and offered refuge to waterfowl during their fall migrations. Hunters were doubly discouraged in this way from pursuing game.

The fence around the inner woodland could be entered through a gate otherwise kept padlocked. In the winter, members of bird and nature clubs and of sportsmen's organizations regularly visited the area with feed for the birds. Management was needed to main-

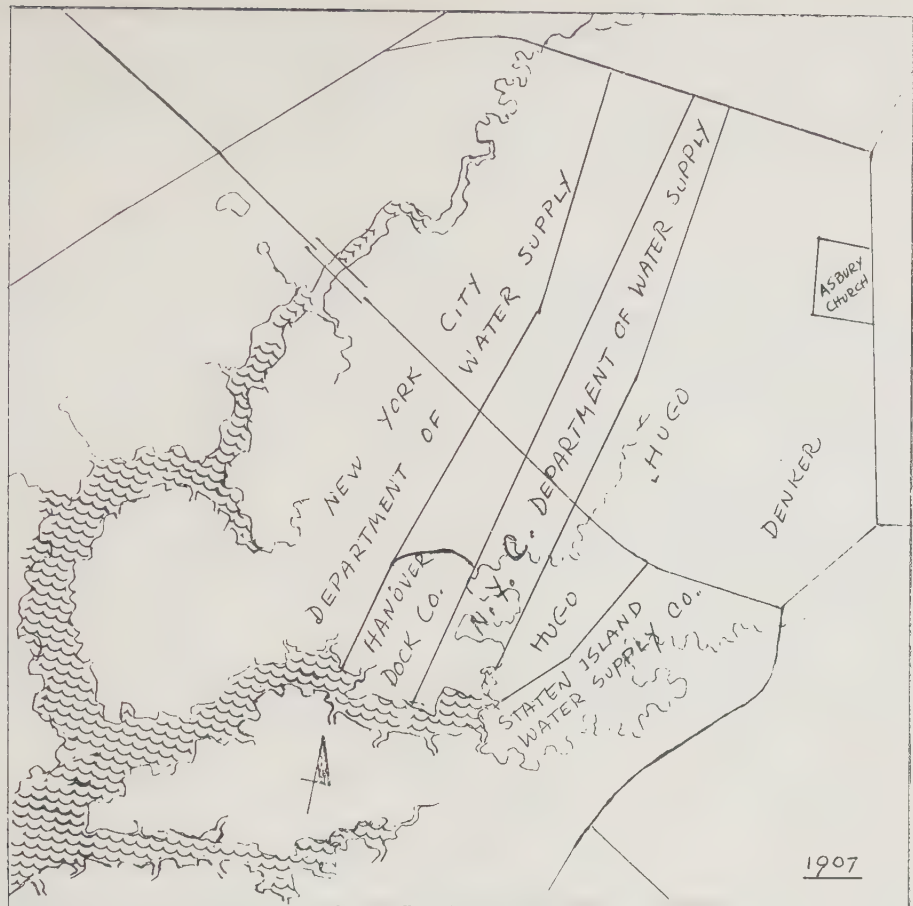


Fig. 3 1907. New York City Department of Water Supply had taken over Crystal Water Works' lands by this year.

tain the trees, bushes, and vines which provide food as well as cover; to replace them if necessary as well as to plant useful species. Department of Parks' workers tried to prevent the spread of the Dutch elm disease by cutting down and burning infected trees. The manpower shortage during the Second World War forced the abandonment of this campaign.

The purpose of the park being that of a sanctuary for birds, regularly scheduled trips and heavy trail upkeep were unnecessary. It was important, however, to insure that the purpose was maintained and that intrusions from the outside would not upset severely the ecology of the area. Although the Department of Parks was responsible for the City-owned lands surrounding the Sanctuary as well as those adjacent to it, a portion of these lands was assigned to the Department of Sanitation to be utilized for sanitary-land-fill

areas (or disposal of City garbage). A series of discussions between the Institute and the City resulted in the limitation of the area to be used for this purpose to the marshes to the south of Main and New Springville Creeks since 1945. This, hopefully, would limit any changes to the Sanctuary's ecology.

Use and Management from 1955 to the Present. By 1955, members of the Staten Island Museum's Section of Natural History, under the leadership of the Director of the Museum at that time, Dr. James L. Whitehead, had persuaded Mr. Robert Moses, then Commissioner of the Department of Parks, to enlarge the area of the Sanctuary by adding a tract of higher ground, some of it wooded and some in farmland, and another large section of salt marsh. Much of the land in question was already under the jurisdiction of the Department of Parks, although some marshland, as mentioned previously, was reserved for the Department of Sanitation. With the lands of the Sanctuary as its core, the additional 209 acres added by the City brought the total acreage for the projected Wildlife Refuge to 260.

Included in this parcel was some active farmland, part of which is still being leased by the City to a grower who supplies the wholesale market in house plants from his nursery located there. An abandoned house and outbuildings, which had reverted to the City, were at the other end of this strip of farmland. These were torn down to reduce a possible fire hazard. The leased land is not being used for the Refuge as long as the City continues to collect rent for it, but it is included officially within the Refuge's boundaries.

A small irregularly-shaped section of land jutting from the Eastern boundary of the Refuge encloses the bend of Vreeland Brook, a major watercourse totally contained within Refuge boundaries. This was also included in this parcel.

With the addition of 209 acres, the purpose of the Sanctuary was changed to that of a Wildlife Refuge. Mr. Robert Moses described the Park Department's point of view in a letter to the Director of the Institute in 1954, Dr. James Whitehead, as follows in part: ' . . . our park areas become ever more valuable as centers for active and passive recreation, and where the area is large enough and the park topography of sufficient variety, for the study of nature. New Springville Park of 260 acres fills all of the specifications for an

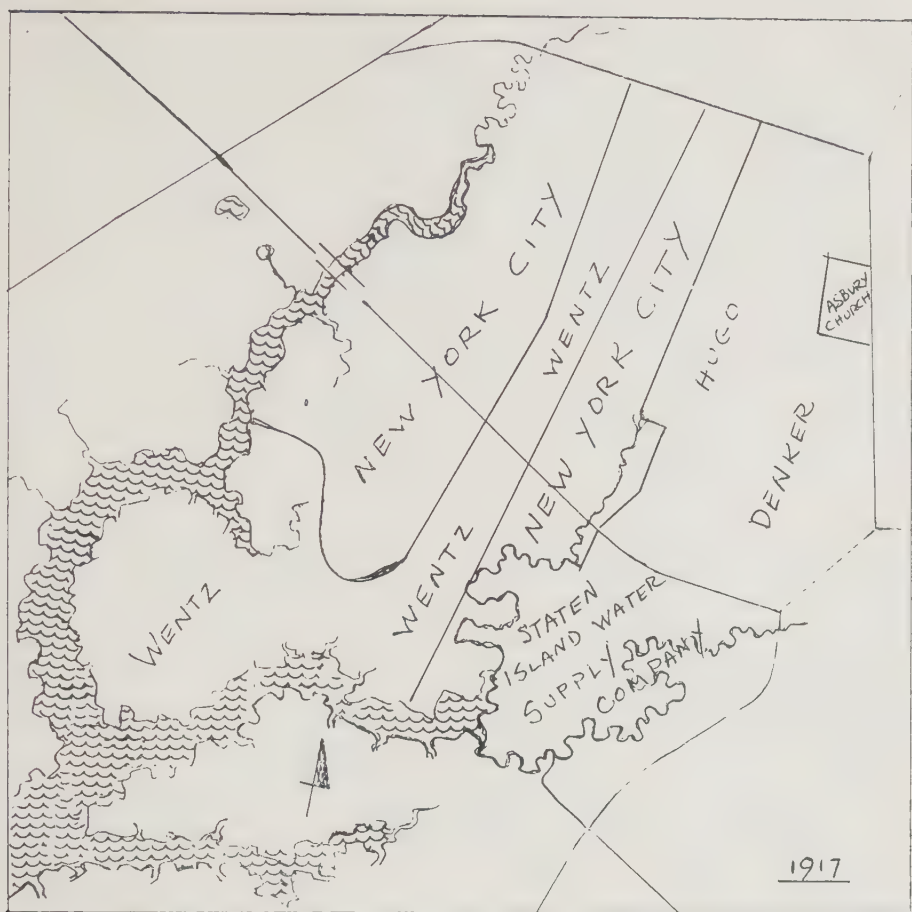


Fig. 4 1917. Catskill water was serving Staten Island by the end of this year. New York City retained the ownership of some of the land.

ideal wildlife nature center. It should be invaluable to students in public and high schools in Richmond for field work to supplement their academic work in zoology and botany, and of course, to members of nature societies and clubs from all sections of the City."

The Institute's Committee on the Wildlife Refuge originally had these purposes well in mind for the planned Refuge. The Committee had suggested setting up a program of guided trips, studies, and management of the area which would necessitate a full-time Park Superintendent, who would probably live on the premises, and a full-time Curator of Conservation, who would direct the planning of the nature education program, the scheduling, and ecological studies and research. The addition of two full-time positions to the City's budget was not accepted, and instead the Institute was encouraged to work on an "interim program" — to use private funds and, where feasible, to use volunteer work.

In 1955, preparing such a program, even a limited one, presented problems. Precedents had to be set and new associations between City departments and citizens' groups had to be explored. No other wildlife refuges or sanctuaries existed within the City limits at that time. Jamaica Bay refuge was to open soon afterwards, but there were as yet no past experiences within the City for the Institute's Committee to study. The Institute received great support in setting up prototypes for practices from both the Department of Parks and the Board of Education, and was able to develop and to administer a program. (This was to prove important as experience from which to draw when High Rock Park was acquired ten years later by the Department of Parks and set aside, under the Institute's administration, for nature study on Staten Island.)

The duties which a Curator would have assumed: responsibility for the control of class and guide scheduling; the instruction of guides and other personnel; continuing research into the Refuge's ecology; and reports in the manner and as required to the Park Department, the Board of Education and the Institute, were all divided among volunteers. Finally it became expedient to include these activities in the work of the Institute's Curator of Science.

The management and maintenance of the Refuge required much more than had the Sanctuary. The area is five times as large and its wider topographical range requires corduroy trails and also well-kept footpaths. Its use by a far greater number of people demands bridges and sanitary facilities as well as benches.

Heavy maintenance has been provided by the Department of Parks' crews seasonally, or when necessary. A guard had been assigned on a regular parttime basis to the Refuge up until 1968 when the position was deleted by the City from its budget. The loss of the position of guard has meant that continual maintenance on the spot of trails, bridges, and fallen trees has been abandoned. It has made it necessary to seek additional management and maintenance aid from volunteer labor and the Institute's staff.

Subsequently the trail area was enlarged to offer a varied terrain for instruction in the field, as well as to provide quiet areas where birds and animals would not be disturbed. The program of guided trips was planned along the trail system in this area, but although it was hoped that the program could be offered with seasonal variations during a good part of the year, it has settled into a four-month program (April and May in Spring, September, October and early

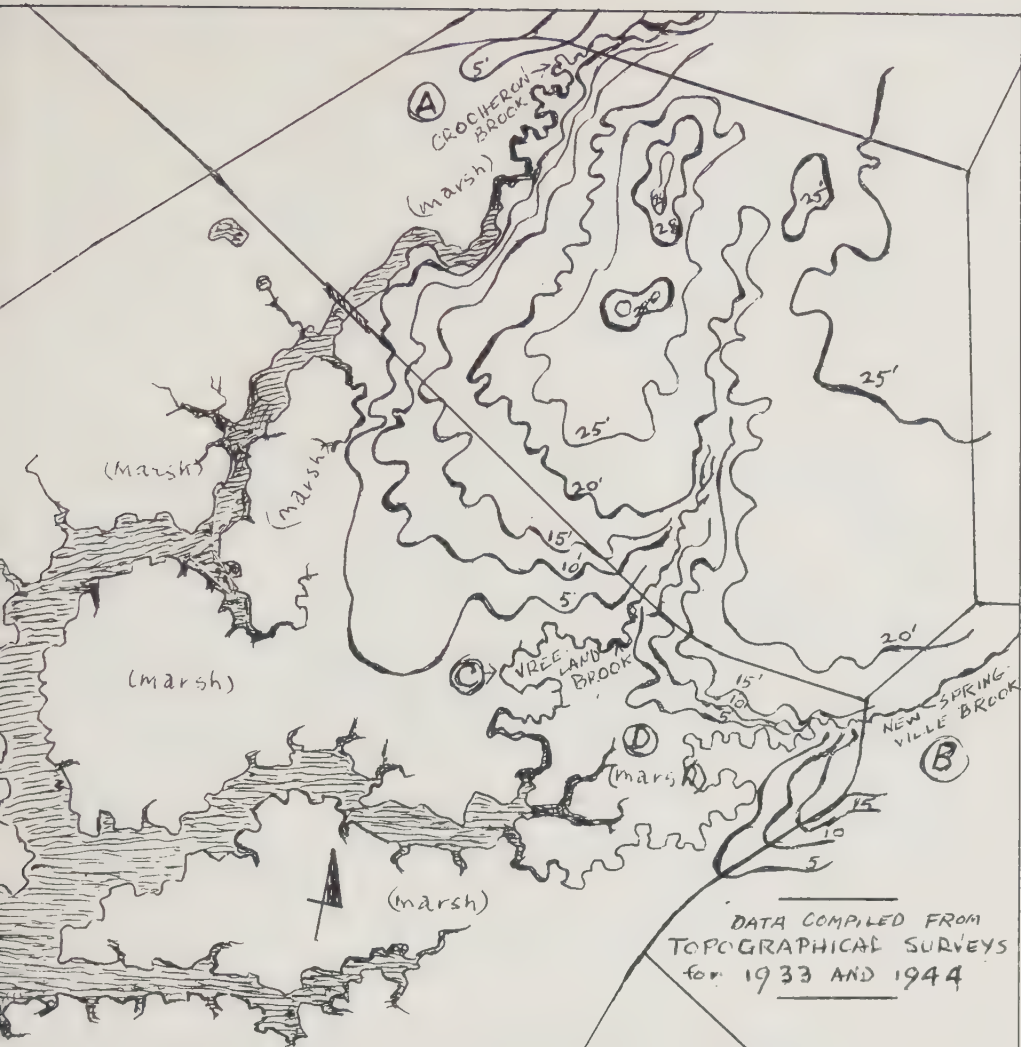


Fig. 5 Topographical map, based on maps prepared in 1933 and in 1944. Land contours shown increase by five feet up to 25 feet above sea level. The highest portion shown here is 29 feet above sea level. Three major brooks are shown: A. Crocheron Mill Pond Brook, which had its source on the westerly side of Todt Hill and runs through Willowbrook and Willowbrook pond to its final drainage into Neck Creek. B. New Springville Brook which rose in a pond which was at Rockland Avenue and Manor Road. C. Vreeland Brook, which is the result of the confluence of underground streams and is totally contained within the land area south of Signs Road.

The marshes shown are all salt marsh except for (D) which is a freshwater marsh.

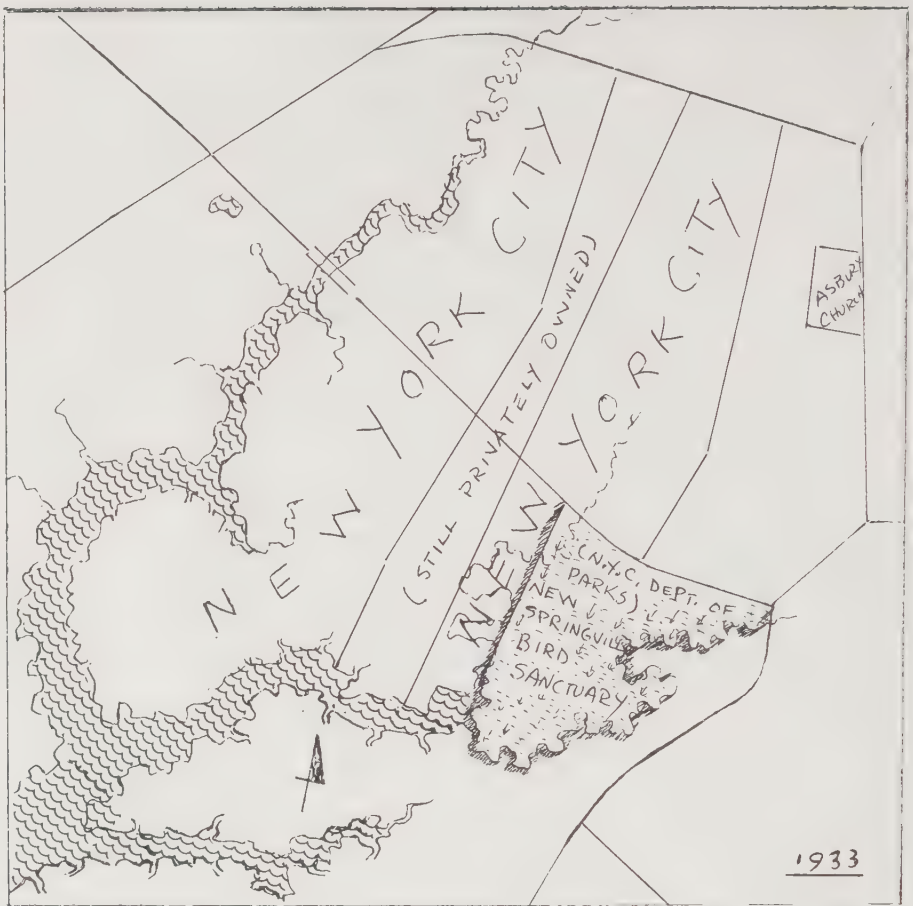


Fig. 6 1933. Showing the portion of land allotted by the City to the development of the Bird Sanctuary.

November in the Fall). Summer months were abandoned for any programmed activity because of the nuisance of biting flies and mosquitoes. Winter months were given up because of the absence of shelter.

In recent years, the school program has had to be restricted to morning hours only because of conflicts between school hours and school transportation. With all these limitations in available time, the program at the Davis Refuge still is utilized by approximately 4,000 school children and their teachers annually.

When the Refuge opened in 1955 it was dedicated in honor of William T. Davis at the request of the Institute and with the consent of Commissioner Moses. It is a fitting memorial for the Staten Island naturalist and entomologist who had died in 1945 and who, all of his life, had learned from nature and wildlife and helped others to learn.

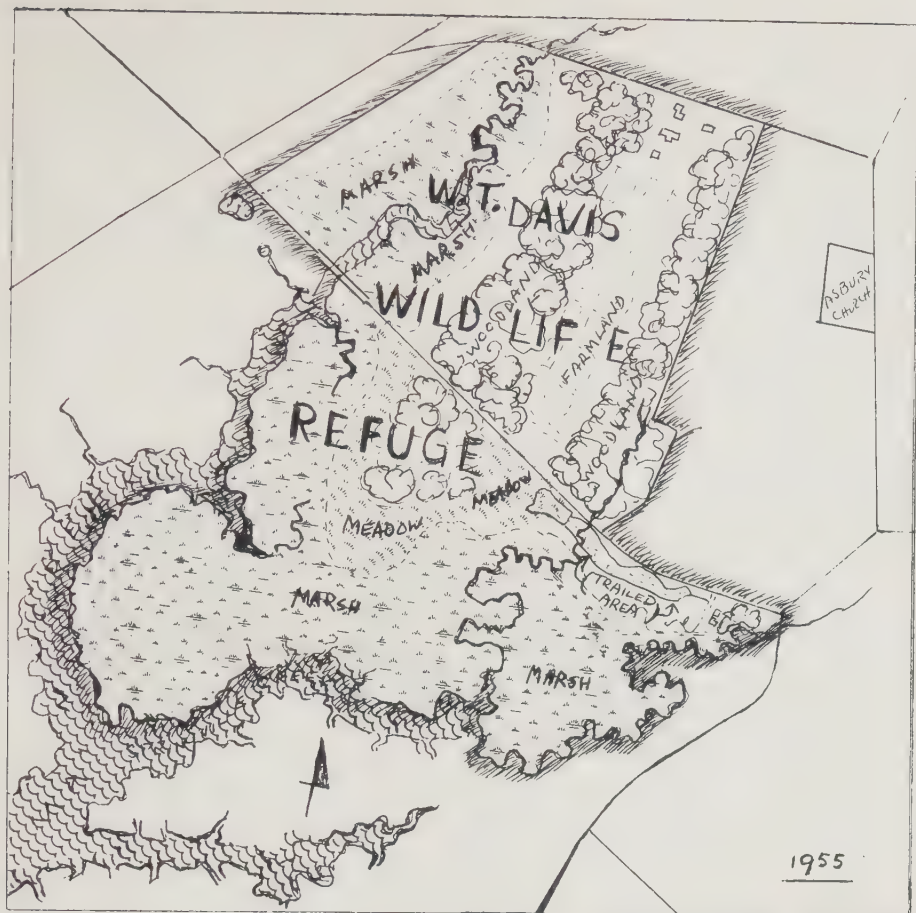


Fig. 7 1955. Showing the portion of land added to the existing Bird Sanctuary to create the entire Wildlife Refuge.

The Environment Around the Refuge. Variations in the natural history of the Refuge were predicted in the *Proceedings* for 1957 "as the development of parks planned for the Fresh Kills area proceeds." What were not predicted, probably because they could not be imagined at that time, were those changes to be brought about through the great increase in human population immediately adjacent to the Refuge.

Historically the surrounding lands were used in much the same manner as was the acreage of the present Refuge. Until very recently much of the adjacent property yielded vegetable crops for wholesale and roadside markets, while the unfarmed land supported large old houses on generous lots. Since the 1950's, most of these lands have been sold, parcel by parcel, to builders.

Many new roads are to be built in the area and old roads are to be widened. The expected widening of Richmond Avenue is to be accompanied by a widening of Travis Avenue which, as mapped,

will obliterate one of the trails already in use at the Refuge. Park Drive North is mapped to connect a widened Signs Road with Travis Avenue and apparently will be laid over much of the stream course of the Vreeland Brook and therefore on parkland. There seem, as of this writing, to be no plans as to the manner in which the stream will be preserved. That this road actually will be on a section of parkland pertinent to the Refuge's ecology has significance for the future.

These roads will border on two sides an area on which new houses are being built. Approximately 4,000 people are now living in the houses already completed where formerly less than 100 families lived. When all the building development is finished in this area, at least twice that number of people will be living there.

Since these homes, which are north-east of the Refuge, are on ground higher than that of the Refuge, gravity acts to pull the effluents from their septic tanks and sewers down into the ground water of the Refuge. Additional contaminants may be available from the controversial treatment plant for a development planned to house 2,000 families on the other side of Richmond Avenue.

Invasion of contaminants percolating through the sanitary landfill adjacent to the creeks bounding the Refuge can be expected for a good many years to come. These pollutants undoubtedly will affect the marshes of the Refuge. Plants, trees, grasses, ferns, and bushes may grow more lushly than ever before, but insect populations will change, and of greater importance, the character of the marshes will change to be reflected by the microscopic life, algae, and mollusks.

Originally it was thought that the main mechanism that would change the Refuge's ecology would be the installation of a tide gate to turn Main and Richmond Creeks into constant-level fresh-water lakes. This would eventually alter the character of the salt marsh to that of a fresh-water marsh, including its plant and fish life, its insect and bird life; and the water would no longer be tidal.

This last aspect is important: the flushing of the marshes at high tide is very necessary to the maintenance of a salt marsh. The whole life of this marsh depends on whether pollution of the water from the land can be controlled. Recognized sources of pollution may be the following: 1) The adjacent landfill operation, composed of mountains of garbage covered with four to six inches of soil and extending landward along the arms of the Fresh Kills. Rain water

trickles through the garbage and into the nearby creeks. These creeks all are part of this watershed. 2) For many years the farmers around the Fresh Kills have fertilized their fields with manure and chemical fertilizers. Since there is still some farming being done near the Refuge, the runoff from these farms carries with it enriching nitrates from the fertilizers. 3) Some of the older houses and many of the newer ones are equipped with cesspools for sewage disposal. These may overflow or break down, allowing the drainage to seep into the creeks and streams through the underground and surface springs and groundwater. 4) Two swimming pools are in the drainage area, discharging water of questionable quality.

Tests on the water quality of the area have been conducted recently. The lush growth of algae and other marsh vegetation are additional proof that these conditions now exist and there is no known plan to improve the situation.

When waters thus polluted accumulate behind a dam, the nitrogenous content of the water will be rapidly increased. This will produce a lush growth of minute floating plants, including algae, which phenomenon is called "algal bloom." These plants then become so dense that they filter out the sunlight preventing the water plants, such as marsh grasses, from growing. When these plants die, oxygen is no longer produced and other organisms in the water die of oxygen starvation. Thus we then have a "dying" or "dead" pond, lake, or marsh. If this can happen to a lake as large as Erie, it can happen to a small pond or marsh.

While tidal flows partially flush the area every 12 hours, even though the job of flushing away pollution is not complete, it certainly is better than the accumulation of pollution behind a dam. (This is well demonstrated at Wolfe's Pond Park, where the water flowing into the pond brings with it much sewage effluent from cesspools in nearby areas, and is prevented by a tide gate from flowing out. The New York State Conservation Department has pronounced this pond to be presently too polluted for good fish life and recommends that efforts be made to reclaim it, including abating the pollution from the cesspools.)

It is our opinion that if the dam across the outlet is not constructed and the creek left in a tidal state, the tidal flows will flush this creek. Although the Arthur Kill from which the tide floods the creek is highly polluted, at least pollution from landward is not allowed to stagnate and will continue to be moved out in part.



Fig. 8 1970-A Proposed and mapped changes for the area, showing new roads, new housing development, and those roads which are to be widened. (Drawing by Eddy Kamil.)

The threat of this tide gate may no longer loom since funds to build the tide gate have not been appropriated.

In summary, new metamorphoses within the Refuge will come from a real explosion in the human population within the vicinity and from its refuse; from a continuing increase in car and truck traffic; through threatened loss of a strip of woodland and of a trail and possibly of a watercourse.

Effects to which the Refuge has been exposed for the past two decades or so include those from the chemical pollutants in the air from New Jersey; pesticide-spraying by plane (including DDT); motor traffic; and sporadic vandalism.

None of the past influences show any signs of abating — instead increases in such pollutants are indicated — and these added to the new list of attacking agents sum up the changing conditions in any urban region in this country.

(*Note*: Please check Appendices following this article for sources and amplification of conditions and plans discussed in the foregoing section.)

A New Program for the Refuge. The past fourteen years have seen the “interim” program in force, a request reported earlier in this article. Fourteen years is a very long “meanwhile” indeed.

The full program, as originally planned, needs to be instituted but with new features as dictated by the changes within the environment around the Refuge. The administration of the Refuge should be broadened considerably, not only to insure staff and provision for the continuation of field trips and lectures to schools, but also *to consider the entire Refuge as an ecological laboratory for the use of research teams concerned with environmental investigation.*

Administrative aids for the latter consideration could be found within an academic consortium. The Institute is not specifically a center for training students, but the Refuge could be a future resource for student-training in ecology and environment research. Such a program would most effectively be administered by the Institute with one or all of the four colleges now on Staten Island. These colleges are Richmond College and S. I. Community College, both of the City University of New York; and Notre Dame College and Wagner College which are privately-endowed institutions.

(A) Three areas should be selected for specific study: 1) The Vreeland strip, which has higher grounds with moist woodland and

vegetation believed to be the longest standing within the Refuge's acreage, should be managed to retain its character as a control. A study of the ecological relationships and successions therein as contrasted against changed nearby environments should be pursued. This area should be totally fenced against invasion except by permit and most likely this area alone should be designated as a *refuge*.

Further loss to the Vreeland strip should be avoided by petitioning against the continuation of Park Drive North more than, at most, two-thirds of its planned length. Park Drive North could be made into a cul-de-sac or instead could be continued into the parallel road one block to the East, avoiding any connection with Travis Avenue at the precise spot where the Vreeland Brook crosses under Travis. If this is achieved, the Brook could remain in the open and not be confined to a culvert. The courses of its northern branches which remain within the park area and do not penetrate past Signs Road could be engineered into westerly ravines. The Brook is important to the life of the Refuge and should be protected.

Action to avert the road changes should be instituted immediately. Their final solution may dictate the eventual scope to be assigned to the newly designed program.

2) The salt and fresh water marshes should be developed for migrant waterfowl as suggested later on in this article. Studies might be initiated to assess a gradually metamorphosing marsh biota reflecting the changes in the ground water.

3) The third area of management and observation should be the abandoned farmland and meadows in which "botanical succession is rapid, insect census closely reflects changes in the flora and fauna" (Loery 1957) and small animals and birds look for food and shelter.

(B) If the trailed area is to be used, it must be protected. The widening of Travis Avenue to 80 feet will, as the present approved plans show, destroy most of one trail and interrupt those branching from it. It will also deplete the amount of solid ground available for trails in the area regularly used by the largest groups. Travis Avenue will not only be widened but also will be continued past Richmond Avenue and the newly-named Draper Place to parallel Rockland Avenue and Richmond Hill Road (both also to be equally widened) and to connect with Forest Hill Road — providing a superfluity of 80-foot-wide roads in a geographically tiny area. The



Plate 1 Aerial view on November 20, 1966, of the Wildlife Refuge area showing the extent of new housing construction at that time and the section of Park Drive North, so far completed, which composes the west boundary of part of the new construction. The sanitary landfill operations on the marshland in the vicinity can be identified by the white areas. (Scale: one inch = one thousand feet.)

(Photograph taken for Lockwood, Kessler & Bartlett, Inc., Engineers, Syosset, N. Y. Reproduced with their permission.)



(Superimposed heavy outline indicates partial North and East boundaries of the Wildlife Refuge.)

Plate 2. Aerial view taken on January 26, 1968, of the Wildlife Refuge area, showing the extent of construction 14 months later. The white areas here indicate frozen marshland and ice on open water. The photograph was taken in late January after some days of extreme cold. (Scale: one inch = one thousand feet.)

(Photograph taken for Lockwood, Kessler & Bartlett, Inc., Engineers, Syosset, N. Y. Reproduced with their permission.)

heavy traffic encouraged by such engineering will cut right through the heart of a Refuge and research area — not to speak of parkland — and will make any field trips or studies very difficult, if not impossible.

(C) The New York City Department of Parks allocated funds some years ago for a building described as a “restroom.” This building would not be sufficient for the needs of the program as it now stands, and would be totally ineffectual for the program’s expansion. Although the money has been appropriated, the project as described seems to have been shelved through the cuts made by the “austerity program” now in force in the City.

More to the point would be the authorization of the construction of an interpretive center and classroom with appropriate offices, sanitary facilities, storage areas, exhibition space, and lecture and projection rooms. Wherever located within the Refuge, such a building would help in providing extension of the program through the winter months and in sheltering classes in inclement weather in spring and fall months. An office to be used by a future curator and provided with exhibition, laboratory, and storage space would ensure the enlarged dimensions of the program.

Both the Refuge and High Rock Center are constantly booked to capacity. Hundreds of teachers and thousands of pupils are disappointed each year in being unable to attend either one. An interpretive center would increase capacity many times over.

(D) After consultation with experts from the New York State Department of Conservation to determine the possibilities at the Refuge, it was recommended that some of the abandoned farmlands be mowed annually to retard the growth of trees and the invasion of woodland. Maintaining these lands in the field period of succession provides a much richer habitat for a variety of wildlife. Presently much of the abandoned farmland has become overgrown with arrowwood, shrubby dogwood, and young trees such as ash, ailanthus, and sweet gum.

Also proposed was the development of one or two small ponds which could be scooped out of the wet edges of the woodland to provide a new habitat for fish, frogs, ducks, herons, and shorebirds. If these ponds are planned sufficiently near the trails it would be possible to observe some of the wildlife.

A viewing platform and a blind erected in the marsh would enable these observations and photography as well to be carried out without disturbance. The construction of a viewing platform some

distance from present trails has long been desired. Similar access has been built in southern swamp refuges so that technology and experience are available for consultation.

(E) As air pollution from chemical and heavy industries continues to mount, it has become less feasible for growers to maintain greenhouses and fields on the West shore of Staten Island.* It is possible that the lands and buildings which the City leases to plant-nurseries will be abandoned eventually. This land is officially part of Refuge acreage and the presence of sound buildings and greenhouses would make it possible for an interpretive center to be pioneered by adapting these structures to the needs of such a center. The favorable location as well as the fact of the buildings may make it more feasible for the City to wait than to appropriate construction money which in the ordinary course of events of a capital budget would not make the funds available for some years.

(F) The Refuge's name should be expanded to indicate its broadened program. Whatever its name becomes, it should continue to be a memorial to William T. Davis and efforts to legalize this appellation should be made.

In summary: The Refuge's interim purpose was to teach conservation and to introduce school children from urban areas to nature, in addition to the original intention of providing sanctuary for birds and other wildlife. For the present and future the Refuge might be defined as the inner core of the land area and the surrounding areas might provide developmental and environmental studies of the varying effects on a natural area by encroaching urbanization.

Every day becomes important in studying, analyzing, and deducing from these changes. Such a remarkable opportunity is not often to be found in most urban areas. Therefore the importance of this project transcends local — i.e., county and state — application and may be, instead, of national importance.

* Appendix I: 6, 7

APPENDIX I: *Newspaper Sources*

1. "Hearing slated on map of wider Richmond Ave." *The Staten Island Advance* June 24, 1968. "... the 160-foot width would be for the stretch between Rockland Ave. and Arthur Kill Rd."
2. "Housewife tells septic tank woe." *The Staten Island Advance* January 25, 1968. "... lives on Carreau Ave. in the Brentwood Homes development, completed 2½ years ago. There are about 95 homes in the development ... a septic cleaner completed a pipe line from (the) ... septic tank to an 'underground stream' more than 70 feet below ground." The housewife had stated previously that "'Ten or 15 people have a water drainage problem. The overflow from septic tanks backs into houses. ...'" (For street location, check maps accompanying this article.)
3. "Street cave-ins prompt study." *The Staten Island Advance* March 1, 1969. Involves subsidence of street twice on Freedom Avenue, New Springville. (For street location, check maps accompanying this article.) Article concluded with a statement attributed to a city representative that "there was a possibility that an underground spring might be causing erosion of the land upon which the (sewer) lines were installed, but further study was necessary."
4. "OK for sewage plant tied to posting bonds." *The Staten Island Advance* June 21, 1968. "The firm which plans to develop a large area north of Forest Hill Rd. with up to 2,000 homes, was granted a permit to build the (sewage treatment) plant two years ago. ... However, the firm found it impossible to have any insurance company provide the \$300,000 bond required by the City to guarantee the operation. ... This agreement was amended to allow other houses, outside the firm's development, to be served by the treatment plant."
5. "Flooding pinned on catchbasins." *The Staten Island Advance* January 16, 1969. "A spokesman for Heartland Village, New Springville, said that the flooding condition on Richmond Ave., at the intersection of Nome Ave., was caused by ice that plugged up

two catchbasins. He said the water originated from nearby streams that overflowed when temperatures rose above the freezing point earlier this week."

6. "Mayor urges Hughes to probe source of New Jersey pollutant." *The Staten Island Advance* July 8, 1969. "... The waves of sulphur dioxide that spread over the Travis community June 28 destroyed nearly the entire commercial crop of Mohlenhoff & Sons, growers for the wholesale flower market in Manhattan. ... The Department of Air Resources reported that its monitoring station at Sea View ... recorded a sulphur dioxide concentration greater than 5 parts per million over a 15-minute period on (that evening). The average concentration from 10 p.m. to 11 p.m. was 2.5 parts in contrast to the normal sulphur dioxide level in the Travis area of .10 parts per million. The city agency also reported that its telemetry station showed winds ... coming from the northwest and southwest ... no source of sulphur dioxide emissions on Staten Island was responsible for the 'extraordinary concentration of this pollutant.'"

7. "... and on Staten Island farmers eye the land." *The Staten Island Advance* July 27, 1969. "... , he points to crops being destroyed by air pollution, only one of the enemies of an urban farmer. ..."

APPENDIX II: *Other Sources*

1. Hagstrom's "Map of Richmond (Staten Island) N.Y. City" House Number and Transit Guide. Map #2080A.

2. "FRESH KILLS LAND FILL=100 acres for private development=100 acres of parks, arterials, public works." City of New York, Borough President of Richmond, Construction co-ordinator, Department of Sanitation, Department of Parks. November, 1951.

3. Report by Gordon Rumore, chemist, to the Director of the Staten Island Institute of Arts & Sciences, April and May, 1968.

4. City of New York, Borough of Richmond, Office of the President, Bureau of Engineering: The following maps:

A. MAP establishing the lines & grades for Victory Boulevard Extension . . . Park Drive West . . . Victory Boulevard . . . Travis Avenue . . . Park Drive East . . . and also establishing a Park . . . and the elimination of a part of Schmul Park . . . July 28, 1955. Approved Sept. 8, 1958.

B. MAP establishing the lines & grades for Victory Boulevard . . . Signs Road . . . Park Drive North . . . Travis Avenue . . . and also establishing a Park . . . July 28, 1955. Approved Sept. 8, 1958.

C. MAP establishing the lines and grades of a street system within the area bounded by Travis Avenue, Park Drive North, Signs Road, Victory Boulevard, Graham Avenue, Lander Avenue and Richmond Avenue . . . April 27, 1964. Approved January 7, 1965.

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(1957) "The William T. Davis Wildlife Refuge." Additional specific studies by Cooper, Loery, Redjives, and others. Vol. XX: No. 1

Natural History Notes

Cyanea capillata, Red Jellyfish or Lion's Mane

Four freshly dead specimens of this jellyfish were found at Ward's Point, Staten Island, New York, on July 14, 1969. All were about fifteen inches in diameter. The rust-red pouches hung down about six inches below the transparent umbrella of the jellyfish. The specimen were identified with the aid of a color reproduction in the April 1969 *Oceans*. The accompanying caption stated that this species occasionally reaches a diameter of about eight feet with tentacles of 200 feet when fully extended. It is common from southern New England to the Arctic Ocean. Its tentacles are poisonous and are said to have killed swimmers.

Diestrammena marmorata, Asiatic, or Conservatory Cricket

This East Asian species was introduced to this country in 1898 in Minneapolis, and a few years later appeared in Springfield, Massachusetts. It is assumed that the species was brought in with plant materials used in greenhouses and spread from there.

This year 18 of these crickets were discovered when a box, which had not been disturbed for several years, was overturned.

The discovery was made by William Liccione of Prospect Avenue, Staten Island. One specimen was mounted for this Museum. There were no specimens previously in our entomological collections.

— M. P. Weingartner

ABOUT OUR CONTRIBUTORS

Mathilde P. Weingartner is Curator of Science for the Staten Island Museum and also responsible for the program, scheduling, and planning for the William T. Davis Wildlife Refuge. She has been the author of many articles printed in this *Proceedings*, as well as in other publications, and also is the author of *The Staten Island Walk Book*.

George O. Pratt, Jr., is the Director of the Staten Island Institute of Arts and Sciences which administers the Staten Island Museum, the William T. Davis Wildlife Refuge, and High Rock Park Conservation Center.

Gail K. Schneider is the editor of the *Proceedings* and the librarian for the Institute.

Eddy Kamil, who contributed the drawing of the map reproduced as Figure 8, is a student in architecture at Pratt Institute, Brooklyn, N. Y.

PROCEEDINGS

Staten Island Institute of Arts and Sciences



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Editor: G. K. Schneider

The 1968 Season at the Wort Farm Site, Staten Island

*Contribution Number 4 of the Metropolitan
Area Archaeological Survey*

by PATRICIA N. DEUSTUA

In the Spring of 1968 a field class from Columbia University under the direction of Professor S. Gorenstein continued excavation at the Wort Farm Site (Std 2-3 on Staten Island. The results of previous work at this site have been reported by L. Williams (1968). A total of six five-foot squares were dug in 1968 near Williams' Area A (1968: 41). The present report discusses the material found in four of these squares.

In general the material found by the Columbia group conforms to the patterns of distribution reported by Williams. The greater part of the material recovered in 1968 consists of unworked cores, core fragments, and flakes. Two worn potsherds and four projectile points were also found.

The general stratigraphy of the site is as follows: A humus layer of approximately 2" is underlain by brown sandy earth—the plow zone—which extends to a depth of up to 14" below the surface in some areas. Beneath this is a yellow sandy stratum of undetermined depth.

In one square (IV A) a total of 13 yellow jasper core fragments and 10 yellow jasper flakes were found. Of these, 5 core fragments and 4 flakes were on the surface. Two core fragments and a flake lay in the transitional level between the plow zone and the yellow sand stratum at 10 to 11 inches from the surface. Six core fragments and four flakes ranged in depth from 12 to 18 inches from the surface in undisturbed yellow sand. One flake was found at a

depth of 23 inches. The argillite core and two argillite flakes found in this square ranged in depth from 16 to 21 inches. Argillaceous materials tended to be found beginning at about 18 inches below the surface underneath the first six inches of the undisturbed yellow sand stratum. The exception to this tendency was a projectile point made of argillite found in the plow zone of Square IV A at a depth of 6 to 9 inches below the surface.

The two plain sherds recovered were found in the plow zone, thus conforming to the pattern described by Williams in which pottery was found high, in the plow zone or immediately below it (Williams 1968: 51). They are reddish-brown, grit tempered, each 5 mm. thick, and appear to be smooth, though somewhat eroded, on both surfaces.

The stemmed argillite projectile point found in the plow zone has an over-all length of 5.5 cm. The tip of the point has been broken off. The width at the shoulder, the broadest point, is 1.9 cm. One shoulder is well-defined, the other less so. The profile in cross-section is lozenge-shaped and measures 0.5 cm. at the thickest point. The eroded condition of this point makes it difficult to determine flaking patterns and use characteristics. However, it would appear that one edge has been bifacially flaked, resulting in a sinuous edge showing slight unifacial spalling. The base is straight and is thickest just above the stem, which suggests that the point may have been utilized as a knife. This point seems to fit the characteristics of Bare Island points as described by Kinsey (1961).

Three additional projectile points were found. Unfortunately, however, their provenience is not as clear as is that of the point just described. A triangular point of yellow jasper was found at a depth of 30 inches in a disturbed area. It measures 3 cm. in length; 2.3 cm. in width at the base, the broadest point; and is only 0.3 cm. thick. The shape in cross-section is flat, tapering at the tip, edges and base. The over-all shape is an isosceles triangle with a convex base. One corner of the base is slightly thicker than the other. The point is bifacially flaked with bifacial retouching on the edges and the base. This point falls within the range of characteristics described by Ritchie (1961: 31-32) for Levanna points.

Another triangular point made of very worn argillite was found in the yellow sand stratum, probably within the uppermost six inches (approximately 8 to 14 inches from the surface). The tip of the point has been broken off and is asymmetric with regard to the corners of the base. The edges and base are irregular. The over-all length of the point is 3.2 cm.; the width at the base is

2.4 cm.; and the breadth is 0.4 cm. at the thickest part in the center, tapering toward the edges and base. The point is so eroded at present that no description as to flaking or use patterns can be made, nor can positive identification as to type, although it would appear to conform to the characteristics of Levanna points (Ritchie 1961: 31-32).

The last point to be described is made of yellow jasper and was found in the yellow sand stratum at a depth of between 8 and 32 inches from the surface. The blade is roughly triangular in outline to the shoulder with a short stem. One shoulder is clearly defined, the other much less so. The tip has been broken off. Over-all length is 3 cm.; width is 1.6 cm. at the shoulders. The breadth is 0.9 cm. The point has been bifacially flaked from a center rib. One edge has been bifacially reworked. It is not clear whether the point is completely finished as there is a flaw in the stone running from the point where the well-defined shoulder joins the stem diagonally to the opposite edge about two-thirds up from the base. This area does not show as much work, although part of the retouched edge lies within it. This point seems to have some of the characteristics of Lamoka points as described by Ritchie (1961: 29-30).

(August 1969)

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A Selection of Sources for a History of Conservation on Staten Island

by GAIL K. SCHNEIDER

Will the future historian, or possibly, archaeologist describe the decade spanned by 1960 through 1969 as the opening of the space age? Or instead will it be termed, after technicians have dug through giant middens, the beginning of the dissolution of the earth's environment?

The contradictions which may lead to this catastrophe lie between technological progress and the earth's inherent balance which assures continuation of life. Species and environment are interdependent through complex natural laws. The flood of technological additions and inventions with its refuse, effluents, and gases interrupts ecological continuity.

Ten years ago ecology, which was a term used only by scientists, today is found in the vocabulary of newspapers, government, and business. Since man is an organism, when we learn to understand his relationship with the environment, other life forms sharing this environment with him assume a new importance.

This concern with man's environment may seem new to a majority of people, but historically this is not so. Conservationists and other thoughtful citizens have been entering protests against the evidence of purely technological progress as destroyer of wildlife and degrader of pure air and water for many years. Careful examination of a century of reaction against such insults to the environment gives rise to the belief that we would not now be faced with the existing severe pollution problems if more attention had been given to the warnings implicit in these early protests. Or if at least some of the earlier protests had been successful.

This institution has been involved in conservation since its founding in 1881. Its founders recognized the threat that foul air

and water had for the island and individually and together acted to try to halt contamination at its source. The record of changes on the island in the past ninety years suggests that today a majority of islanders are existing to their detriment in an environment of increasingly poor quality. Any changes which have been made were palliatives and not corrections of a substantially worsening environment. Although the threat of epidemics is of no consequence today, any modern catastrophe would insure that epidemics would occur, if, for example, City water supplies were interrupted for any length of time.

A look at some of the history of actions for conservation of the environment of Staten Island bears out the thesis that our environmental situation would not be as acutely endangered today if yesterday's warnings had been heeded.

For example: If a suit against "stench-nuisances" emanating from across the Kill von Kull had been won in 1883, would there have been, in 1969, an air pollution episode in which such a high percentage of sulphur dioxide was recorded that one wholesale flower grower lost his entire crop and uncounted individuals suffered respiratory problems? In 1883, four refineries were named as culprits. Among the emissions which disturbed island residents were sulphuric acid fumes, or sulphur dioxide. In 1913, in a similar complaint pressed with the City and the State of New York, fourteen New Jersey concerns were named as culprits and the same emissions were prominently named in the complaint. Both suits failed in their objectives. Today the number of chemical processors, oil refineries, and metal works which crowd the shores of the Kill von Kull and the Arthur Kill is so great that the offending ones cannot be discovered without a constantly alert army of inspectors with monitoring devices.

The original suit on "stench-nuisances" also accused certain of these concerns, as well as the tankers which transported the crude oil to them, with polluting the waters of the Kill. This, in fact, has been illegal for a very long time, but was it already too late when the law was enacted? The Kills have been found to be increasingly sterile of fish- and plant-life because of the destruction of the water biology by the introduction of all kinds of wastes, chemical and otherwise, past the saturation point of these waters in their narrow channels. Although these are tidal waters, the configuration of the channel plus the slower bay tides have demonstrated that flushing is incompletely accomplished after almost a month of regular tides. In the internal curves of the Kills,

the pollution "slug" remains stationary, losing a little, adding a little more pollution with each gentle tidal movement.

For example: In 1902 a brief was filed to prevent the construction of the Passaic Valley sewer outlet near Robbins Reef, at the mouth of the Kill von Kull. The case reached the Supreme Court by 1921, coincidentally with the *completion* of the sewer! This sewer has continued to be one of the major sources of pollution for the harbor and the Kill, pouring untreated wastes from millions of residents of New Jersey and hundreds of industries. Its breakdown during the summer of 1969 caused severe problems during a very rainy season when such pollution is most serious, especially for swimmers.

These are only two instances taken from the history of past actions in conservation. The conclusions to be reached can be either to give up action against pollution totally, or to learn from past history and adapt action to the situation.

The first conclusion would find us getting ready to emigrate to the moon, since earth is fast becoming unliveable. However, after seeing the surface of the moon by television, many would rather try to reclaim the earth and make it what it has been for millions of years: Man's habitat along with all organisms with which he shares it.

Perhaps our method of resorting to legal action is too slow and too easily circumvented. Perhaps the whole orientation, the philosophy for earth's survival, must be changed *from* a planned obsolescence which produces a "GNP" of burgeoning unmanageable waste *to* a planned total consumption which includes methods of re-use of the unconsumed percentage, which should therefore be small. As the scientists have reminded us, we are not a nation of consumers, we are a nation of users.

The biologist, Raymond Dasmann, has suggested that we may have reached the point in many areas of this country where there can no longer be any justification for new highways, airports, factories, or other construction because of the impending total loss of environment.

The initiative becomes the responsibility of all of us; it can no longer be left to the individual corporations or even to the top echelons of government.

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Trees; The Passaic Valley Sewer; A Plan for Richmond;
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Smoke and Noise Nuisances of the SIRT.

ANNUAL REPORT
of the Staten Island Institute
of Arts and Sciences,
1968 - 1969

by GEORGE O. PRATT, JR., Director

The Staten Island Museum. For many years the programs and activities of the Staten Island Museum have been stabilized at a maximum use of our meeting, exhibition, and storage space. All the programs which have been maintained in the past year continue with the exception of the Saturday morning Junior Museum which was suspended as a result of economies in the funds allocated for personal services.

The Institute, through its programs at the Museum, the Wildlife Refuge, and High Rock Park, places a large amount of its emphasis and resources in education. Attendance for the year for all three locations totalled 124,222 for all functions.

At the Museum, registration for adult courses receiving In-Service credit persists at the very high level experienced in recent years. Attendance at meetings of Sections and other specialized groups has been kept at an adequate level.

On the other hand, daily public visits to our exhibit galleries are still hampered by the complete absence of parking space anywhere within a convenient distance from the Museum during working hours. This lack and the general obsolescence of the Museum building, with its inadequate storage, exhibition and office space, is an all-too-familiar topic to those with a special interest in the future of this institution. The Institute's Trustees and its Director have spent many hours in efforts to find either a new site or a new building for the museum. We have considered a range of alternatives from that of an entirely new building on an entirely new site, to an old, or landmark, building which could be refurbished and made suitable for museum purposes.

At present our effort for a new museum building is centered on a consolidation study funded by the City and conducted by the

landscape architectural firm of Clarke and Rapuano. This study will analyze the operations of both the Staten Island Museum and High Rock Park Conservation Center to determine the feasibility of combining the two. The study will be completed in early 1970.

The Museum Building in St. George: Increasingly a Problem in Maintenance. The Staten Island Museum building was constructed in 1918. Two additional floors were added in 1928. As with many of the achievements of the founders of the Institute, this building was unusually well-constructed and durable. However it is no longer particularly well suited to the requirements of a modern museum. Most especially aggravating to those who must work in the building and to those who supervise its maintenance, is the critical absence of space for storage and for exhibition construction.

Compounding these problems are a deteriorating roof, an overloaded electrical system, an aging boiler, and a lack of ventilation throughout the building which becomes particularly unpleasant in warm weather. The tortuous and painfully slow progress of the City toward rectifying these conditions is frustrating and discouraging. Heavily inflated construction costs have added significantly, and perhaps irremediably, to our problems since the funds appropriated several years earlier for repairs, as yet not done, are no longer at all adequate.

Library and Publications. For nearly the entire life of the Institute, its publications and the Library have had particular significance among our programs and activities. The Library cannot be separated from publications since the basis for establishing the Library was, and still is, the extensive numerous scientific periodicals which are received regularly from other institutions of like interests in exchange for our own publications. In 1968 and 1969, one-thousand-and-eighty such exchanges in science and history were received by the Library, plus two-hundred-and-eighty-nine gifts. In contrast, thirty-two purchases of books were made for the Library during the same year.

Particularly gratifying during 1968, 1969 was the enlargement of the library work-storage area through the creation of the library annex, an area approximately 30x20 feet, in the auditorium of the Public Health Building in which the Institute's offices and library are already located. We are indebted to Dr. Anne Kent, Health Officer of the Borough of Richmond, for her recognition of our acute need for additional space, and for the Health Department's subsequent allocation of this area for the annex. The annex now

houses the extensive collection of historical reference material relating to Staten Island.

Institute publications, under the guidance and supervision of the Publications and Library Committee with Mrs. Gail Schneider as Editor and Librarian of the Institute, included: three issues of the PROCEEDINGS, a specially-bound reprint of an article, "Field Guide to the Minerals of Staten Island," from the PROCEEDINGS; ten issues of THE NEW BULLETIN; the Education Department brochure; and Fascicle 4 of AULACODISCUS. An especially handsome pamphlet on our Print, Map and Photograph Collection was prepared as a conclusion to, and with assistance from, the grant tendered by the New York State Council on the Arts. This will be distributed in 1969 and 1970 through the offices of the Institute as well as those of the Council.

The position of Editor and Librarian is two full-time jobs. The work requirements for this position are essentially unfair and are made more so by our inability to get the City to acknowledge the equity in establishing a pay rate at least equal to an advanced librarian in the City Library system. For tolerating (if barely) these and other aggravations and still doing the job we are grateful to Mrs. Schneider.

Although the new library annex has eased our library storage problems, we are greatly concerned about the need to improve the distribution of our publications. Too often, issues of the PROCEEDINGS are mailed to members and exchanges many days or weeks after being received from the printer. We plainly need additional space and personnel with which we can create a mailing and shipping department.

Our lack of such a facility also means that we cannot advertise and promote our publications as we would like, since we cannot handle any additional demands.

For having somehow managed up to now to cope with our mailing problems, we are grateful to Mrs. Louie, Membership Secretary, who has contributed a great part of her energy and organizational drive to getting out the Institute's publications while caring for the membership as well as our office mimeographing and copying needs.

Art Department. The rising costs of staging our art exhibitions within a stationary budget have required increased curatorial resourcefulness and ingenuity. Happily the Curator of Art, Barry Leo Delaney, has these qualities in abundance to supplement his innate sense of scholarship.

In exhibits, the emphasis this year was on contemporary painting. The Fall season opened with "40 Now California Painters," followed by "Recent Paintings of Freda Mulcahy and Rosemary Tung." The contemporary emphasis was broken by the exhibition of "19th Century Chinese Costumes," but resumed again with the exhibition of "Elizabeth Olds: Collages, Prints, Water Colors," in the Spring.

The outstanding acquisitions for the year were several gifts from contemporary artists of their own works:

"Daisy Field," by Freda Mulcahy. Acrylic painting on canvas. A68-22

"Which Came First?" by Rosemary Tung. Acrylic painting on canvas. A68-23

"Study of a Young Negro Girl," by Adrian Rappin. Oil sketch on board. A69-2

"Little Pigs Going to Market, Guatemala," by Elizabeth Olds. Water Color on paper. A69-7 (See Plate 1.)

The following are among the donors to the Costume and Textile Collection: Miss Adrienne G. Bedelle, Miss Bertha Lea Bedelle, Mr. and Mrs. Edward Chalif, Mrs. Jacob J. Ebeling-Koning, Mrs. William Ford Goulding, The Estate of Mrs. Ruth T. Guiterman, Miss Helen M. Hotchkiss, Mr. C. Otto Kienbusch, Mr. and Mrs. Keith K. Kimball, Mrs. Josiah P. Marvel, Mrs. Ben Ali McAfee, Mme. Attilio Teruzzi.

Although all of the additions to this area are of interest, the following pieces may be singled out as of special importance:

Two embroidered Mandarin Squares for Chinese civil officials of the Ch'ing Dynasty, late 18th-early 19th centuries. A68-19.1,2
Donor: C. Otto Kienbusch.

Chinese K'o Ssu silk Dragon Robe, 19th century. Donor: Mme. Teruzzi. A69-1 (See Plate 2.)

Brocaded ecclesiastical cope, French or Italian, 18th or Early 19th Century. Donor: Mrs. William Ford Goulding. A69-5.1.

The Spring Show of the Section of Art was held from May 11 to June 8, 1969. The jury was: Donelson F. Hoopes, Curator of Painting and Sculpture, The Brooklyn Museum; Robert H. Luck, Associate Director, The American Federation of Arts; and Gene Magazinni, painter. The recipients of the Weissglass Awards were: Gerald Bernstein, First; Daniel Werner, Second; Ann Weber, Third. The recipients of the Section of Art Awards were: Hannah



Elizabeth Olds 1967

Photograph by Manuel Rubio

"Little Pigs Going to Market, Guatemala" by Elizabeth Olds. Water color on paper. Accession Number A69-7 (Pl. 1)

F. Grunberg, James Milton Meade, and Michael Notarfrancesco. Susan E. Blair received the William F. Flack Memorial Award (Honorary); and Thomas H. Brady received the Canio L. Zarrilli Memorial Award (Honorary).

In addition to two In-Service courses, the Curator gave the following lectures to various groups at meetings on- and off-Island: "Lyndhurst: A Gothic Revival Castle on the Hudson"; "Venice Biennale of 1968"; and "Two Art Centers of Italy—Florence and Venice."

Science Department. The changes on the main floor of the Museum, occasioned by the relocation and enlargement of the museum shop, have displaced some exhibit cases and dispensed with others entirely. The moves which have been made are mere forerunners of more changes which can be expected to be made in the future here, traditionally our main science exhibition area. The removal of the mastodon wall-painting from the location it had occupied for many years will be followed by redesigned exhibit cases and wall treatments.

The restricted exhibition budget, which has not kept pace in this Museum with needs dictated by changing trends in exhibition processes, necessarily prevents any fast and/or total completion of design and installation. Instead it will be necessary to proceed in a piecemeal and leisurely fashion to complete one part at a time. This does have the advantage of offering something new amidst the familiar sights to the regular visitor to the Museum.

The Curator of Science, Miss Mathilde P. Weingartner, recorded new accessions for the science collections from Miss Doris Meltzer, Ben Feitelson, and others.

Art and Science Education Department. The Art Education Department continued its offerings of curriculum enrichment lessons for children under the imaginative and capable guidance of Freda Esterly, artist and lecturer. Our Island's teachers selected, depending upon grade, from nine different lessons: "Animals in Art," "America as Seen by Its Artists," "How to Look at a Painting," and "Civilization Through the Ages: A six-part series." Altogether 8484 children attended the art lessons. The costs for these Museum lessons are borne entirely by the Institute's endowment funds, and remain the only art appreciation programs regularly available without charge to our schools—an as-yet inadequately appreciated museum service.

The Museum continued to be overtaxed by visits from off-Island and summer camp groups who often fail to inquire about our ability to provide meaningful experience for their groups before suddenly appearing, one to two-hundred strong, without an appointment or even advance notification! We regret the waste of leaders' or teachers' time as well as that of the pupils which is inevitable where trips are undertaken without adequate preparation and advance permission.

Lessons in science and conservation for school children were given by Miss Mathilde Weingartner, Curator of Science. We are proud to be one of the few institutions in New York City dealing with the *now* problems of environmental education through Miss Weingartner's school lessons: "Changing Staten Island" and "New York City—Natural Resources and Conservation," a two-part lecture. Two-thousand-eight-hundred-and-twenty-two pupils attended Miss Weingartner's lectures.

Miss Weingartner supervised the programs of guided tours of the William T. Davis Wildlife Refuge in which 2750 participated during the fall and spring months. For the seventh consecutive year, the Junior Audubon Club met Friday afternoons under Miss Weingartner's leadership. Attendance for this year was 271.

Children's attendance in all Museum and Refuge programs for 1968 totaled 22,051. (The ten-week school strike reduced attendance in comparison with previous years.)

Maintenance. The deteriorating condition of the museum building has, on occasion, required heroic efforts on the part of the supervisory and maintenance staff. Gone, but not forgotten, are the six inches of water which were discovered submerging the auditorium's floor one morning. Not yet consigned to oblivion is the memory of the intense and heavy rainstorms which deposited gallons of water on the floor of the attic through leaky flashings. Then, too, we have recollection of the sudden and untimely suspension of some critical function of the furnace or boiler. Besides coping in a herculean manner with such unexpected occurrences, Mr. Taverna and his staff refurbished the auditorium walls, continuously repainted and improved the upstairs galleries, built exhibit cases, reconditioned a portion of the public health building auditorium as a library annex, helped maintain the trails of the Wildlife Refuge, and guided the development and renovation of buildings and structures at High Rock Park.

High Rock Park Nature Conservation Center. The massive, continuous, and all-embracing support by the public, the school administration, the teachers and their pupils for the program at this Center continues to be a source of immense satisfaction. In a year marked by so many crises—ranging from the school strike to the brink-of-disaster proposed cuts in the budget—it was indeed gratifying to see High Rock emerge strong and unscathed. Undoubtedly this can be attributed to the universal acceptance of its purpose and program. We believe that Americans, and especially residents of urban areas, are beginning to awaken to the urgency of protecting what little remains of our precious natural environment. This is reflected in expanding attendance at the natural history lectures established as a memorial to our founder, William T. Davis, and more importantly, is reflected in the increased willingness of individuals and groups to expend their time and energy in the protection and preservation programs. There is no doubt High Rock benefited enormously from this resurgence of concern.

During the past year the lessons offered at High Rock have been broadened and now include: "The Effect of Air Pollution on the Environment"; "Population Studies"; "Water Pollution"; "Sea Shore Ecology." Altogether, more than thirty lesson-topics are offered to the schools. For the solid pedagogical base which supports the projection of such courses we are indebted to Mr. Harry Betros, High Rock's Director of Education.

Another accomplishment and source of great satisfaction during the year was the further development of relationships with our Island's colleges. Under the able direction of Mrs. Cynthia Jacobson, Field Coordinator, all of our colleges have participated in programs at High Rock. We deem this to be strategically important in developing awareness of the environment on the part of all of us. Enthusiastic teachers, informed and motivated to communicate with their pupils, are our most precious resource. Generally, environmental awareness must be achieved during the teacher's training in college, or much later when perhaps many years of opportunities will have gone unrecognized.

High Rock's wide-spread influence through the City in conservation circles has been due significantly to its support by the High Rock Development Committee of the Community Council of Greater New York. The members of this Committee have been articulate and persuasive advocates of environmental education throughout the City, under the chairmanship of Mrs. Gretta Moulton. The Committee was particularly effective in mobilizing

support from innumerable levels of the City's public and private components in the budget crisis of May and June, 1969.

Altogether, some 19,830 children attended scheduled lessons at High Rock. The figures were reduced from the preceding year because of the school strike. After-school-hours, holiday, and weekend visits, according to registrations only, totaled 7,390. Many special groups, such as the Elementary Science School Teachers' Association, made use of High Rock.

William T. Davis Wildlife Refuge. The surging population increase on Staten Island has been far from completely beneficial to the Institute's programs and interests, especially those in natural history. Many areas once much favored for walks and field observations have disappeared as small-tract housing has spread over the western half of the Island.

Within the last two years more than 900 homes on 600 lots have been constructed immediately north and east of the Refuge, effectively ending the sense of isolation which has been one of the Refuge's charms. To the west the Sanitation Department continues to fill-in the salt marsh areas; to the southeast, realignment and widening of Richmond Avenue will have some effects on the Refuge.

These, and other Refuge problems, have been reviewed in Volume 24, Number 2, of the PROCEEDINGS, and the recommendation made therein summarized here; Staten Island is quickly losing its open space—long considered by non-Islanders as its most remarkable and engaging quality. There is still time to prevent further destruction to the Refuge and we hope that members and their friends will express their concern to our public officials.

Membership Activities. The membership enrollment was watched closely during 1968 to determine the effect of the rise in fees on membership enrollment. Happily we are able to report that membership has held, and actually increased, during this period. There are 815 members in the several categories.

As in past years three William T. Davis Memorial Lectures, held in the auditorium at the Staten Island Community College, were provided for members and three Members' Events, which were produced at the auditorium in the Museum, as follows:

A Bandoncon Recital by Alejandro Barletta. This recital was designated as a Memorial to George Salzman, a member active

for many years in the cultural and musical activities of the Museum specifically and on Staten Island generally.

"The Ancient World—Athens to Cairo," a film and lecture by Gene Wiancko.

A Concert by The Daphne Hellman Trio (harp, guitar, bass).

The Members' Events and the Davis Lecture programs owe their success to the hard work and the fine feeling for imaginative programming possessed by Mrs. Elsie P. Verkuil. Our thanks, too, to Mrs. Elizabeth Marziale for assisting in the welcoming of members to both the activities at the Museum and at Community College. To our members who may have been disappointed in being unable to obtain seats we extend our apologies, but do advise immediate reservations in all cases as the seating capacity in the museum auditorium is so severely limited, and reservations must be made on a first-come, first-served basis.

Mrs. Jacqueline Louie, Membership Secretary, has developed and maintained a consistent correspondence with members, whether they are new, continuing, or wavering. For many members, she is their most personal and continuous contact with the Museum and the Institute. A large part of the success of the Institute's steady membership enrollment and increase is hers because of her courteous, individual response in good humor to a member's inquiry or request.

Although this is her main responsibility, it is also incumbent upon her to send out all publications and notices to the membership. Her expertise in handling machines (as well as people), make her indispensable in the smooth operation of the administration activities.

Administration. Over the past seven years I have noted that greater and greater administrative and fiscal skills are routinely required to maintain and enlarge our programs. In this period, Pensions, Medical Benefits, Blood Credit Programs, new and more complex Budget and Work Performance Programs, have become a way-of-life in our offices. Knowledge of these matters is now so specialized, intricate, and detailed that this Director cannot even hope to master and keep abreast of developments.

Had not we had the gifted, analytical, fiscally-astute, and administratively wise services of my assistant, Mrs. Elsie Verkuil, and her assistant, Mrs. Elizabeth Marziale, the Institute would have been swamped long ago. As measure of the magnitude of their accom-



Photograph by Manuel Rubio

Chinese K'o Ssu Silk Dragon Robe, 19th century. Donor: Mme. Teruzzi.
Accession Number A69-1 (Pl. 2)

plishment, consider that they have flawlessly presided over the budget expenditure of at least one million dollars in the last four years, often with only their native good sense and judgment to guide them.

Thanks / Acknowledgements / Urban Corps. We wish to express our gratitude to those who supported our work in their various ways: To the Staten Island Museum *Women's Auxiliary* for their annual contribution of \$600 to the General Fund and of \$500 toward the renovation of the auditorium walls. These moneys can be contributed only because of the Auxiliary's hard work in organizing trips and benefits. Nevertheless this was work done so efficiently and with such skill as to seem effortless.

To the *Museum Guild* for their continuing and faithful support of our school education program. Only by their efforts can the Institute continue this program despite rising costs.

Often the staff can maintain its record of accomplishment only through the assistance of *volunteers* in secretarial work, in the library, and at the Refuge. We wish to thank the following volunteers for their services: Mrs. Robert Meyer, Mr. and Mrs. Philip Benjaminson, Mrs. Robert Bornkamp, Mrs. William Cronin, Mr. John Dreyer, Mrs. Jean Edler, Mr. Denis Fleming, Mrs. Alice Johnson, Mrs. Helen Rogers, Mr. Arthur Peters, Mrs. Celia Polomany, Mrs. Philip Powles, Mrs. Denise Koopman, Miss Elsie Van Deusen, Mrs. William R. Vom Saal, Mrs. Julia Von Bevern, and Mr. Robert Wigand.

Our work has been importantly assisted by several *Urban Corps* workers from the Mayor's Office: James Elliott, St. Francis College; Miss Alexa Perry, Marymount-Manhattan College; John Umana, University of Michigan; Robert Rumbold, Manhattan College; Stuart Helfand, Harpur SUNY; Ray Gaspard, Columbia University; and Richard Clarke, Yale University.

The grant from the *New York State Council on the Arts* provided for the employment of two parttime workers, Mrs. Elizabeth Saxe and Mr. Hugh Powell, who recorded, catalogued, and cross-indexed information on the Collection of Prints, Photographs, and Maps, through most of 1968.

Summary. From the vantage point of the Director, no problem seems more urgent than our need now for more space for administration. The staff as a whole has less than one-half the office space which is considered a minimum by today's architectural standards. With such limited space, problems of noise—telephones, type-

writers, visitors, new members, researchers, volunteers, and repairs which go on, inside or outside the building, sometimes arbitrarily—have worsened. Concentration has become more and more difficult, frustration has increased, and the quality of our work is harder and harder to sustain.

On behalf of myself and the Institute's staff I devoutly hope that the next Annual Report will be able to announce categorically a great and lasting improvement to our working conditions.

—GEORGE O. PRATT, JR.

Director

Staten Island Institute
of Arts and Sciences

Annual Report of the Treasurer

1968/69

Receipts and expenditures of the Institute in the fiscal year ended June 30, 1969, are shown in the following summary:

RECEIPTS:

Interest and dividends	\$25,131.54
Dues from individual members	7,010.00
Other dues (organizations, etc.)	598.00
Museum shop profit	2,937.85
Contributions and miscellaneous	2,844.41

TOTAL RECEIPTS \$38,521.80

EXPENDITURES:

Salaries and supplements to City-paid salaries	\$12,571.00
Other Museum operating expenses	12,031.45
Publications	2,396.01
Davis Memorial Lectures	1,149.25
Miscellaneous	1,968.40

TOTAL EXPENDITURES \$30,116.11

Additional gifts aggregating \$15,875.42 were received for specific purposes, and other funds were collected for special activities. These amounts and the expenditures therefrom are excluded from the above summary, as are gifts of objects for exhibit or other purposes. The Institute also received \$65,000 from the Ford Foundation and \$65,000 from the Department of Parks for the administration and maintenance of High Rock Park Conservation Center.

Principal Funds increased \$17,435.97 during the year from profit on sales and exchanges of securities.

At June 30, 1969 the private funds of the Institute were represented by the following:

Securities held by Institute:		
U. S. Treasury Obligations		\$13,000.00
Other		59,875.62
Securities held by First National City Bank		274,071.68
Securities held by Dean Witter		49,327.77
Cash held by Institute:		
Checking Accounts	\$12,148.84	
Savings Accounts	48,935.40	
Petty Cash	300.00	61,384.24
Cash held by First National City Bank		4,053.03
Stone Property		4,784.59
Museum Shop inventory		1,290.36
High Rock Shop inventory		—
Nominal value of equity in Museum Building,		
Exhibitions and Fixtures		1,000.00
Payroll Tax Withholdings		(665.73)
	Total	<u>\$468,121.56</u>

The City supplemented the above figures with an appropriation under the 1968-1969 annual budget of \$94,976.94. This was used for salaries and maintenance of the Museum in the following ways: Executive Management \$34,459.40; Curatorial \$12,309.89; Building Maintenance and Protection \$37,257.73; Office Supplies, Repairs, Utilities, etc. \$10,949.92.

Victor J. Morone

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STATEN ISLAND INSTITUTE OF ARTS AND SCIENCES

GEORGE O. PRATT, JR., Director

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High Rock Park Conservation Center: Harry F. Betros, Director of Education; Cynthia Jacobson, Field Coordinator; Elizabeth K. Butler, Secretary; Elizabeth M. Marziale, Bookkeeper; Ethel Z. Dicke, Librarian; Helen Hauber and Olive D. Chipman, Clerks; Edwin Rundlett, Editor. Rudolph Lindenfeld, Frank E. Becker, Katherine Johnson, Marie Burke, Olivia Hansen, Gunda Halloran, Robert Zappalorti, Joan Kosan, Instructors. Philip Benjaminson, Vivian Cronin, Dorothy Fleming, Louise Halama, Alice Johnson, Patricia Kissinger, Jean Raymond, Arthur Peters, Marion Briggin, Erna Gundlach, Dorothy Quinlan, John Elder, Guides. Dominic Botta, Superintendent; Michael Betros, Kenneth Lewis, Robert Ottman, Charles Taverna, Anthony Asaro, Michael Larney, Park Attendants.

William T. Davis Wildlife Refuge: Mathilde P. Weingartner, Curator.

BOOK REVIEW

The Drug Scene, by Donald B. Louria, M.D., McGraw-Hill Book Co., N.Y.C.; \$5.95.

This book should be required reading for parents, teachers and teen-agers, or for anyone wanting to have a better understanding of the drug problem as it stands today in this country and in some other parts of the world. In the vast outpouring of books, article and debates on this crucial problem this book stands out for its sober, rational, unemotional approach, backed up by an impressive array of factual information. It is not surprising that this should be so—its author, Dr. Donald B. Louria has had a wide experience in dealing with practically every aspect of drugs and drug addiction and its treatment. This experience has led to his becoming an advocate of humane and rational methods of dealing with drugs; avoiding the often hysterical attitudes of both drug advocates and those who consider the experimental smoking of a single marihuana cigarette enough to place one forever beyond the pale, Dr. Louria presents a clear picture of the true extent of the problem, and offers measures for dealing with it.

Beginning with a discussion of the extent of drug use in this country and an analysis of some of the causes, which as he points out are numerous and very complex, the author discusses each of the major types of drugs and their effects. This is perhaps the most valuable part of the book. Few laymen have a clear idea of the variety of drugs, and how different they are in availability, immediate effects, and long time effects on the user. As Louria points out, there are in general four major categories: *narcotics* (which he defines as only opiates or their synthetic equivalents), *hallucinogens*, *sedatives* and *stimulants*. One great stumbling block to rational handling of the manifold problems is the tendency of the public, and law makers in particular, to lump these all together, generally under the term *narcotic*.

To this reader one of the most startling chapters was that dealing with the drug problem in England, specifically London. It had always been my impression, and I am sure that I am not alone in this, that the English system of allowing addicts to obtain needed drugs by prescription from licensed physicians was eminently sane and humane and should be more widely practiced. Louria, who has been called in as a consultant by London authorities, points out that this system has been far from an unqualified success. In fact, addiction in England has increased alarmingly since its adoption. A principal reason for this is that addicts are frequently able to obtain

much more of the drug than they actually require. They use what they need, then sell or give away the rest, frequently recruiting new users in this way.

One of the most bitterly debated questions of drug use in this country today is that of the use of marihuana and just how useful or harmful this drug may be. Louria's discussion of this question is most enlightening. He is highly critical of the laws dealing with marihuana use, but he is definitely not in favor of legalizing its use. As he puts it, if it were a matter of choosing between alcohol and marihuana, he might vote for the latter as the lesser of two evils. But this is *not* the question; rather it is whether to our already great burden of alcohol use we wish to add still another—marihuana. His answer to this is emphatic "No!"

Because of his involvement with drugs and drug users, Louria has been in a position to observe the hippy cult from the inside as few non-hippies have. His penetrating discussion of their ideas and ways of living makes fascinating reading.

The book closes with a discussion of what the future holds, and of possible ways in which some of the problems caused by drugs might be alleviated, or at least handled more effectively. That the problems go deep and cannot be solved by themselves apart from other facets of our culture is made clear. This is indicated by the last sentence in the book: "Laws can be passed, preventive education undertaken, and millions spent on rehabilitation, but until this society regains its vigor, direction and integrity, the promiscuous, indiscriminate and illicit use of mind-altering and other dangerous drugs will remain a problem."

—Peter K. Nelson

ABOUT OUR CONTRIBUTORS

Patricia N. Deustua, a graduate student in anthropology at Cornell University, was assistant to Dr. Gorenstein, Columbia University, during the continuation of the Wort Farm dig in 1968.

Peter K. Nelson, Ph.D., Professor of Botany, Brooklyn College, and consultant of the Brooklyn Botanic Garden Bulletin. As a member of the Staten Island Institute of Arts and Sciences he has regularly participated in meetings of the Study Group and has acted as moderator for several Symposiums. He is currently a Trustee of the Institute.

George O. Pratt, Jr., is the Director of the Staten Island Institute of Arts and Sciences which administers the Staten Island Museum, the William T. Davis Wildlife Refuge, and High Rock Park Conservation Center.

Gail K. Schneider is the editor of the Proceedings and the librarian for the Institute.

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